

Effectiveness of oral health promotion programmes

An overview of reviews

Patricia Hall

Tonya Moloney

Caitríona Lee

Jean Long

Niamh McGrath

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Research. Evidence. Action.

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Health Research Board
Grattan House
67–72 Lower Mount Street
Dublin 2
D02 H638
Ireland

e hrb@hrb.ie
w www.hrb.ie

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Abbreviations

Abbreviation	Explanation
AMSTAR 2	A MeaSurement Tool to Assess systematic Reviews, Version 2
BASE	Bielefeld Academic Search Engine
BBO	Bibliografia Brasileira de Odontologia
BIREME	Latin American and Caribbean Center on Health Services Information
CCA	corrected covered area
CI	confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CPI	Community Periodontal Index
DARE	Database of Abstracts of Reviews of Effects
DI-S	Simplified Debris Index
DMFS/dmfs	decayed, missing, and/or filled surfaces ('DMFS' is the notation referring to permanent/adult teeth; 'dmfs' is the notation referring to primary/deciduous teeth)
DMFT/dmft	decayed, missing, and/or filled teeth ('DMFT' is the notation referring to permanent/adult teeth; 'dmft' is the notation referring to primary/deciduous teeth)
DOI	digital object identifier
EPPI DoPHER	Evidence for Policy & Practice Information Centre Database of Promoting Health Effectiveness Reviews
GI	Gingival Index
GOHAI	Geriatric Oral Health Assessment Index
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
GROOVE	Graphical Representation of Overlap for OVERviews
HRB	Health Research Board
INAHTA	International Network of Agencies for Health Technology Assessment
ICDAS	International Caries Detection and Assessment System
JBI	Joanna Briggs Institute
LILACS	Literatura Latino-Americana e do Caribe em Ciências da Saúde
MA	meta-analysis
MD	mean difference
MeSH	Medical Subject Headings
MI	motivational interviewing
NRT	non-randomised trial
OHE	oral health education
OHI-S	Simplified Oral Hygiene Index

Abbreviation	Explanation
OR	odds ratio
OSF.io	Open Science Framework
PI	Plaque Index
PICOS	population, intervention, comparator, outcomes, and study design
PRESS	Peer Review of Electronic Search Strategies
PRIOR	Preferred Reporting Items for Overviews of Reviews
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
RCT	randomised controlled trial
RoB	risk of bias
SciELO	Scientific Electronic Library Online
SMD	standardised mean difference

Glossary

Term	Explanation
Bias	Bias is a systematic overestimation or underestimation of an association in research. There are many types of bias, such as selection, recall, observer, and interviewer bias. Bias is minimised through good study design and implementation [1].
blinding	Blinding is a method used in research to ensure that the people involved in a research study – participants, clinicians, and researchers – do not know which participants are assigned to each study group, or which participants experienced the exposure or outcome of interest. Blinding is used in order to ensure that knowledge of the type of exposure, treatment, or diagnosis does not affect a participant’s response to the treatment, a healthcare provider’s behaviour, or an interviewer’s approach to data collection [1].
caries incidence	Caries incidence can be defined as the number or proportion of individuals with new caries at a specified threshold in a given population, detected during a given time period [2].
caries increment	Caries increment can be measured as the change from baseline in any standard measure of dental caries or clinical classification system, such as the decayed, missing, and filled surfaces/teeth (dmfs/dmft/DMFS/DMFT) indices or variations of these indices, or the International Caries Detection and Assessment System (ICDAS) [3,4].
caries prevalence	Caries prevalence can be defined as the number or proportion of individuals in a given population with caries at a specified threshold, at a particular point in time [2].
caries progression	Caries progression can be defined as an increase in the size of a carious lesion in any direction [5].
causality	Causality is the relation of cause and effect. The Bradford Hill criteria for causality are: strength of association or effect size; consistency of findings across studies (known as reproducibility); biological credibility (plausibility); specificity (other explanations); a temporal relationship (exposure occurred before the outcome) and biological gradient known as a dose–response relationship; coherence (consistent with other lines of evidence); and analogy (similar agents act similarly).
Community Periodontal Index	The CPI is used for periodontal health screening and was originally developed by the WHO to measure community oral health. The presence or absence of gingival bleeding is assessed on probing, the presence of calculus, and periodontal pockets [6].
confidence interval	A confidence interval is the range of values (for example, proportions) in which the true value is likely to be found with a degree of certainty (by convention, a 95% degree); that is, the range of values will include the true value 95% of the time) [1].
confounding	Confounding is when a factor has an association with the exposure and can independently cause the outcome or disease. It can over- or underestimate an effect of interest or association. A confounding variable (also called a confounding factor or confounder) is a variable that has a relationship with both the exposure and the outcome variable. Confounding is controlled for by restricting the study population, matching the study population (for age, sex, geography, and/or socioeconomic factors), randomly selecting the study population, undertaking a

Term	Explanation
	stratification in the analysis (for example, by age, sex, geography, and/or socioeconomic factors), and performing regression analysis [1].
control	A control is used when completing an experiment to test an element or intervention. It is the element that remains unchanged or unaffected by other variables. A control is the point of comparison against which other test results are measured [1].
dental caries	A summary of existing literature reports that tooth mineral is lost and gained in a continuous process of demineralisation and remineralisation. Dental caries (dental decay) is a disease of the hard tissues of the teeth caused by an imbalance in this process over time, where there is net demineralisation of tooth structure by organic acids formed from the interactions between bacteria in dental plaque and fermentable carbohydrates (sugars). The dental caries formation process is influenced by the susceptibility of the tooth surface, the bacterial profile, the quantity of saliva, and the presence of fluoride, which promotes remineralisation and inhibits demineralisation of the tooth structure [7,8].
DMFT and dmft	DMFT is the sum of the number of decayed, missing (due to dental caries), or filled permanent teeth. The mean number of DMFT is the sum of individual DMFT values divided by the sum of the population. The acronym 'dmft' is the sum of the number of decayed, missing (due to dental caries), or filled primary teeth. Some countries use the acronym 'deft' (damaged or decayed, extracted/missing, or filled primary teeth) to assess primary teeth. Other variations include 'D(E/M)FT/d(e/m)ft' (damaged or decayed, extracted/missing, or filled permanent/primary teeth) and 'DFT/dft' (decayed or filled permanent/primary teeth).
DMFS and dmfs	DMFS is the sum of the number of decayed, missing (due to dental caries), or filled teeth surfaces in permanent teeth. The mean number of DMFS is the sum of individual DMFS values divided by the sum of the population. The acronym 'dmfs' is the sum of the number of decayed, missing (due to dental caries), or filled teeth surfaces in primary teeth. Variations include 'D(E/M)FS/d(e/m)fs' (damaged or decayed, extracted/missing, or filled permanent/primary tooth surfaces) and 'DFS/dfs' (decayed or filled permanent/primary tooth surfaces).
flossing	Flossing is the mechanical cleansing of interproximal tooth surfaces with string-like waxed or unwaxed dental floss or tape. The two most frequently used methods are the spool method and the circle (or loop) method. In general, flossing is best performed by cleaning each tooth in succession, including the distal surface of the last tooth in each quadrant. Signs that suggest incorrect use include gingivitis and cuts on the interdental papillae. For those who have not adopted or will not adopt a flossing behaviour, another interproximal device may be more effective than no interproximal cleaning; a less effective device used on a regular basis is superior to irregular use of a more effective device. However, the depth the floss can reach is limited, and other devices may work deeper pockets [9].
Gingival index	Gingival index (GI) is defined as a numerical value that quantifies the degree of gingival inflammation based on visual assessment of redness and swelling, as well as the presence of bleeding upon gentle probing of the gingival sulcus. It is

Term	Explanation
	commonly assessed using methods such as the modified L�oe and Silness gingival index, which incorporates both visual inspection and bleeding response [10].
I ²	The I ² statistic is an index measuring the percentage of inconsistency or heterogeneity [1].
interdental cleaning devices	Daily mechanical disruption and removal of dental plaque is considered important for oral health maintenance. People routinely use toothbrushes at home in order to remove supragingival dental plaque, but toothbrushes are unable to penetrate the interdental area where periodontal diseases first develop and are prevalent. Besides toothbrushing, which is the most common method for removing dental plaque, the use of different interdental aids for plaque removal, such as dental floss or interdental brushes, is recommended in addition to toothbrushing. Floss can be used in all interdental spaces, but interdental brushes and other interdental cleaning aids require sufficient interdental space in order to be used by patients. The choice of interdental cleaning aid will depend on the size of the space to be cleaned and the ability of the patient to use the device [9].
International Caries Detection and Assessment System	<p>The ICDAS II is a clinical scoring system that enables the detection and assessment of dental caries activity. The ICDAS II is used in clinical research, in clinical practice, and for epidemiological purposes.</p> <p>Caries codes and descriptions by pit and fissure and smooth surface:</p> <p>0: sound</p> <p>1: first visual change in enamel (seen only after prolonged air drying or restricted to the confines of a pit or fissure)</p> <p>2: distinct visual change in enamel</p> <p>3: localised enamel breakdown (without clinical visual signs of dentinal involvement)</p> <p>4: underlying dark shadow from dentin</p> <p>5: distinct cavity with visible dentin</p> <p>6: extensive distinct cavity with visible dentin.</p> <p>Codes for the detection and classification of carious lesions on the root surfaces</p> <p>One score will be assigned per root surface. The facial, mesial, distal, and lingual root surfaces of each tooth should be classified as follows:</p> <p>Code E: If the root surface cannot be visualised directly because of gingival recession or by gentle air drying, then it is excluded. Surfaces covered entirely by calculus can be excluded or, preferably, the calculus can be removed prior to determining the status of the surface.</p> <p>Code 0: The root surface does not exhibit any unusual discoloration that distinguishes it from the surrounding or adjacent root areas, nor does it exhibit a surface defect either at the cement–enamel junction or wholly on the root surface. The root surface may have a natural anatomical contour, or the root surface may exhibit a definite loss of surface continuity or an anatomical contour that is not consistent with the dental caries process.</p>

Term	Explanation
	<p>Code 1: There is a clearly demarcated area on the root surface or at the cement–enamel junction that is discoloured (light/dark brown, black) but there is no cavitation (loss of anatomical contour <0.5 mm) present.</p> <p>Code 2: There is a clearly demarcated area on the root surface or at the cement–enamel junction that is discoloured (light/dark brown, black) and there is cavitation (loss of anatomical contour ≥0.5 mm) present [11].</p>
mean difference	The mean difference or difference in means is a standard statistic that measures the absolute difference between the mean value in two groups in an epidemiological study. It estimates the amount by which the exposure or intervention changes the outcome on average compared with the control.
mixed dentition	Mixed dentition refers to the teeth in the jaws after the eruption of some of the permanent teeth but before all the primary teeth are exfoliated. The mixed dentition period usually begins with the eruption of the first permanent molars and ends with the exfoliation of the last primary tooth [12].
Motivational interviewing (MI)	Motivational interviewing is a goal-oriented behavioural change strategy that was developed by Rollnick <i>et al.</i> as a collaborative facilitative approach to help strengthen people’s own motivation and commitment to change [13]. It focuses on resolving ambivalence by exploring a person's own reasons for change in an empathetic, non-judgmental atmosphere.
non-randomised trial	A non-randomised trial is an analytic interventional study in which an intervention is allocated by the researchers. The researchers allocate the participants to the intervention group, the comparator intervention group, or the placebo group. This trial design does not control for confounding variables and will have allocation bias. The participants are followed up on over a predefined length of time in order to determine the incidence of the outcome(s) in the intervention group compared with the comparator or control group; the difference in the incidence rate is then calculated. The interventions may be preventive or therapeutic. Data on confounding variables will need to be collected in order to control for confounding through stratification or regression.
odds ratio	An odds ratio is a statistic that quantifies the strength of the association between two events, A and B. The odds ratio is defined as the ratio of the odds of A in the presence of B and the odds of A in the absence of B, or equivalently (due to symmetry), the ratio of the odds of B in the presence of A and the odds of B in the absence of A.
oral health education	Oral health education consists of any combination of learning experiences that aim to improve knowledge and thereby facilitate behaviours that are conducive to oral health [14].
oral health instruction	Oral health instruction is guidance offered to patients or caregivers, such as toothbrushing or flossing instructions, that can be provided by dental hygienists or dentists [15,16].
oral health promotion	Oral health promotion is an integral part of general health, focused on enabling people to achieve the best possible oral health. It is recognised that oral health promotion goes beyond the individual to address the social and commercial determinants and common risk factors of oral diseases and conditions. The broader public health approach links strategies to reducing oral health inequalities, achieving sustainable policy solutions and reducing the environmental impact of oral health systems [17].

Term	Explanation
oral-health-related quality of life	Oral-health-related quality of life is a multidimensional construct that includes a subjective evaluation of the individual's oral health, functional well-being, emotional well-being, expectations of and satisfaction with care, and sense of self. It has wide-reaching applications in survey and clinical research. It is recognised that oral diseases can have varying impacts on people and their well-being and quality of life. Dental diseases cause pain and discomfort; affect proper physical functions like chewing, talking, and smiling; and can influence an individual's social roles [18].
Ottawa Charter for Health promotion	The Ottawa Charter for Health Promotion is a foundational framework for improving global health. It defines health promotion as the process of enabling people to increase control over and improve their health. Published in 1986 it remains relevant today, emphasising that health is created in the settings where people live, work, learn, and play [19,20].
overlap	Overlap between systematic reviews occurs when a single primary study is included in more than one systematic review evaluating the same outcome. For example, Review A and Review B both synthesise evidence on theory-based oral health education for preventing early childhood caries, and both include Primary Study C. It is important to understand the degree of overlap between reviews, because the existence of a large number of reviews on a particular topic may give an inaccurate impression of the size of the body of evidence if many of the reviews are not independent but are instead based on the same relatively small number of primary studies. It is possible to calculate the degree of overlap between reviews (known as the corrected covered area) [21].
permanent dentition	The permanent dentition is the usual number of 32 adult teeth that either replace or are added to the primary teeth, along with the shedding of the primary teeth [22].
Plaque index	Plaque index (PI) is a quantitative measure used to assess the amount of dental plaque on tooth surfaces [23]
prevalence	Prevalence is a term used to describe the proportion of people in a population who have a disease or condition at a specific point in time or during a specific period.
primary dentition	Primary dentition refers to the 20 teeth present that erupt first and are usually replaced by the permanent teeth; primary dentition is present within the primary dentition period [24].
PROSPERO	PROSPERO is an international prospective register of systematic reviews
Q	The Q statistic measures variability between studies.
randomised controlled trial	A randomised controlled trial (RCT) is an analytic interventional epidemiological study in which subjects are randomly assigned to one of at least two groups. The first group is the experimental group, which receives the intervention of interest, and the other group is the comparison or control group, which receives an alternative treatment (current conventional therapy or a placebo). The two groups are then followed up on to see if there are any differences between them with respect to the outcome(s) of interest. The results of the trial compare the incidence of success in the intervention group with that in the control group in order to assess the effectiveness of the intervention. RCTs are the most stringent study design for evaluating the effect of an intervention on an outcome [1].

Term	Explanation
RCT – parallel design	A parallel design RCT is a type of RCT where the participants are randomly allocated to one of two treatment groups and all of the participants in each group only receive one treatment for the entirety of the study. The researcher measures and compares the outcomes in the two groups at the end of the study [1].
relative risk or risk ratio	The relative risk or risk ratio is the ratio of the probability of an outcome in an exposed (or intervention) group relative to the probability of the outcome in an unexposed (or control) group, and it compares the incidence of the outcome in the exposed group with the incidence of the outcome in the unexposed group.
Root Caries Index	The Root Caries Index is one of the most frequently used conventional epidemiological indices to measure the root caries experience at the tooth/surface level. It accounts for the number of cavitated carious lesions and fillings among teeth with exposed roots [25,26].
Simplified Debris Index	The Simplified Debris Index (DI-S) is a key component of the Simplified Oral Hygiene Index (OHI-S) that is used to measure soft deposits (plaque and food debris) on teeth. It scores six specific teeth (incisors and molars) on a scale of 0 to 3, with 0 representing no debris and 3 representing more than two-thirds of the surface being covered. DI-S results indicate good (0.0-0.6), fair (0.7-1.8), or poor (1.9-3.0) oral hygiene.
Simplified Oral Hygiene Index	The Simplified Oral Hygiene Index, developed by Greene and Vermillion in 1964, is a rapid, widely used epidemiological tool for assessing oral cleanliness based on soft debris and calculus deposits. It evaluates six specific tooth surfaces (four posterior, two anterior) in order to assign a score from 0.0 to 6.0, indicating overall oral hygiene as good, moderate, or poor.
root carious lesions	Root carious lesions are located on the root surface of the tooth and are more commonly seen in older people. Lesions are discoloured, soft, ill-defined, and may or may not be cavitated [27,28].
statistical heterogeneity	Statistical heterogeneity is a quantifiable property that is influenced by the spread and precision of the effect size estimates included in a meta-analysis. Baseline heterogeneity can lead to statistical heterogeneity (for example, if effects differ between included populations), but this is not always the case. It is possible for a meta-analysis to display high statistical heterogeneity even if the included studies themselves are virtually identical.
supervised toothbrushing	The supervised use of a brush of one of a variety of designs to brush teeth and gingivae for the mechanical removal of dental biofilm.

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Executive summary

Policy context

Published in April 2019, *Smile agus Sláinte* is Ireland's national oral health policy. The policy aims to transform Ireland's oral healthcare system, in line with the World Health Organization's *Global strategy and action plan on oral health 2023–2030*, by making services more accessible and focusing on prevention rather than just treatment.

Oral health promotion supports this shift from acute intervention to preventive care, which is particularly beneficial to poor and marginalised populations, who are disproportionately affected by dental disease. This requires action at multiple levels: supportive regulatory and health policies (such as water fluoridation) in order to optimise the environment for oral health, alongside targeted community- and national-level oral health promotion programmes that prioritise socioeconomically disadvantaged areas – both rural and urban – and reach people from birth to old age.

Research question

The purpose of this overview of reviews is to present the Department of Health in Ireland with evidence to inform decision-making as to precisely what types of oral health promotion programmes should be provided in order to shift the emphasis from acute care and intervention-focused care to preventive care. Hence, the overarching research question asks:

What is the evidence regarding the effectiveness of population-based oral health promotion programmes to prevent oral disease and improve oral health?

Methods

We followed the established and recommended approach for this overview of systematic reviews, including setting a population, intervention, comparator, outcomes, and study design (PICOS) question and eligibility criteria.

We used a two-stage literature search in order to identify relevant evidence. The first stage of the literature search included 15 search resources: 9 systematic review resources and 6 bibliographic databases and platforms. The second (supplemental) stage of the literature search included forward and backward searching of included papers from primary searches and screening; follow-up of protocols identified during primary results screening and of identified relevant umbrella review references, preprint resources, search engines, and Grey Matters (the search resource operated by Canada's Drug Agency); and follow-up database searches. Our initial searches retrieved 7,835 records, and our supplemental searches retrieved an additional 6,050 records.

Results of the primary and supplemental searches were deduplicated and uploaded to EPPI-Reviewer, the systematic review software, to be screened by three experienced researchers and an information specialist. We used EPPI-Reviewer's priority screening machine-learning mode in order to double-screen the primary search results using screening codes based on this review's eligibility criteria. We double-screened supplemental search results without using priority screening. Any screening conflicts in the double-screening process were resolved by discussion or by referral to a third reviewer if required.

Two researchers used an adapted version of the Joanna Briggs Institute's data extraction form for Systematic Reviews and Research Syntheses in order to extract data on the descriptive characteristics and findings of each included systematic review. We extracted and documented the following data from each included review in tabular format: citation details; objectives of the review; participants; setting;

interventions and comparators; search information; primary study date range; number of primary studies; primary study design; quality assessment/risk of bias tool used; quality assessment/risk of bias assessment results; results by outcome(s); and systematic review authors' assessment using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system. One researcher validated each extraction.

We summarised the main findings, identifying the effectiveness of population-based oral health promotion programmes to prevent oral disease and improve oral health. We then applied a modified GRADE algorithm to the effectiveness outcomes of the included systematic reviews in order to assess the certainty of the evidence. One of the main methodological challenges that researchers face when conducting an overview of reviews is accounting for overlap of primary studies across the included systematic reviews. We used the Graphical Representation of Overlap for OVERviews (GROOVE) tool in order to automatically calculate the corrected covered area (CCA) for a whole matrix of evidence and graphically display the overlap in an easy-to-read figure. Using both CCA and GROOVE improves the identification and management of overlap, helping researchers to detect patterns of shared studies across reviews and ensuring that the synthesised evidence remains accurate, robust, and free from bias.

Findings

Of the 7,835 records identified from our database searches, we screened 5,350 unique records and included 22 systematic reviews in this overview that examined the effectiveness of population-based oral health promotion interventions across the life-course. The 143 primary studies reported across these reviews were published between 1985 and 2022 and originated from countries across Africa, the Americas, Asia, Europe, and Oceania, representing 15 Organisation for Economic Co-operation and Development (OECD) member countries.

We organised the reviews according to three population groups: maternal and early childhood (7 reviews), children and adolescents (12 reviews), and older adults (3 reviews). It is notable that none of the included reviews examined oral health promotion in the general adult population, despite adulthood being recognised as a critical period for maintaining good oral health.

We categorised interventions into five types based on their features:

1. simple oral health education (information and knowledge sharing)
2. theory-based oral health education (including motivational interviewing (MI) and other behavioural counselling)
3. oral health education and training (demonstrations, instruction, and action planning)
4. oral health education and skills acquisition (hands-on practice, techniques, and monitoring)
5. combined oral health education (training and skills acquisition).

The interventions targeted three main outcome categories:

1. oral health status (plaque scores, gingival health, and dental caries)
2. oral-health-related behaviours (brushing, flossing, and diet)
3. oral-health-related quality of life.

The methodological quality of the included reviews varied substantially. Only three reviews were assessed as high quality using AMSTAR 2 (A Measurement Tool to Assess systematic Reviews, Version 2), while the majority were rated as critically low or low quality. None of the reviews reported outcomes with high-certainty evidence. The certainty of evidence across all outcomes ranged from very low to moderate, as

assessed using the modified GRADE algorithm. We identified varying degrees of overlap of primary studies across reviews, with moderate overlap observed for the maternal and early childhood and the children and adolescent populations, and very high overlap (34–44% CCA) for older adult populations, indicating potential over-representation of single studies across different reviews.

Maternal and early childhood

Three reviews examined theory-based oral health education interventions for maternal and early childhood populations, with all of them utilising MI as an approach to oral health behaviour counselling. Moderate-certainty evidence from one review showed a significant difference in dental caries favouring the MI group when measured using the International Caries Detection and Assessment System. Another review reported low-certainty evidence that MI-based interventions had a protective effect against dental caries, although the third review found that MI was as effective as traditional oral health education, as it showed no significant difference in dental caries rates between groups. The implementation of MI methodology varied considerably across studies in terms of the number and duration of sessions, making comparisons challenging.

Four reviews examined simple oral health education interventions providing information and knowledge sharing for maternal and early childhood populations. Moderate-certainty evidence from one high-quality review comparing four different oral health education/promotion interventions against standard care found that diet and feeding practice advice may slightly reduce the risk of dental caries being present and also slightly reduce mean decayed, missing, and filled primary tooth surfaces (dmfs) scores, although other oral health education interventions showed little to no difference compared with usual care. Three additional reviews reported low- to very low-certainty evidence of a reduced risk of early childhood dental caries, particularly when oral health education was incorporated into established maternal and infant health services such as vaccination programmes.

We found very limited evidence that examined outcomes beyond early childhood dental caries prevention. Only one review reported on mothers' oral-health-related behaviours when cleaning their children's teeth, showing very low-certainty evidence of a significant improvement. Only one review examined mothers' own periodontal health in two primary studies, reporting low-certainty evidence of reduced biofilm, dental caries, and periodontitis.

Children and adolescents

One review examined simple oral health education interventions for children and adolescents provided by dental professionals compared with traditional oral health education. Low-certainty evidence showed no significant difference in mean plaque or gingival scores, although some improvements were noted in specific oral hygiene indices. Very low-certainty evidence showed no significant difference in dental caries.

Three reviews examined theory-based oral health education interventions for children and adolescents incorporating psychological behaviour change theories and models. Low-certainty evidence from one review showed a statistically significant improvement in plaque indices and better periodontal status at up to 6 months follow-up, although the effects were not sustained at 12–24 months. The same review reported low-certainty evidence of fewer cavitated lesions in intervention groups. Implementation of theoretical models varied considerably across the primary studies.

Three reviews examined oral health education and training interventions incorporating demonstrations, instruction, and action planning for children and adolescents. Moderate-certainty evidence from one high-quality review's narrative synthesis indicated positive effects on oral hygiene status (plaque and gingival scores) with follow-up at up to 3 months, comparing various modalities, including

leaflets/flashcards/books, smartphone-based/e-learning, and different lecturing approaches. Another review reported low-certainty evidence of significant improvements in plaque and gingival scores in low- and middle-income countries; a third review could not be included due to methodological concerns.

Three reviews examined oral health education and skills acquisition interventions incorporating hands-on practice and techniques for children and adolescents. Low-certainty evidence showed significant improvements in plaque and gingival scores at 6 months follow-up, although oral health status reverted to baseline levels after 1 year unless reinforcement was provided. Low- to very low-certainty evidence from a second review indicated improvements in oral health behaviours, including increased toothbrushing frequency and duration and reduced self-reported sugar intake. Peer-led interventions showed particularly promising results for behavioural change, demonstrating greater reductions in sugar intake compared with interventions delivered by dental professionals or teachers.

Two reviews examined combined oral health education interventions incorporating both training and skills acquisition delivered by dental professionals to children and adolescents. Low-certainty evidence showed statistically significant reductions in plaque scores at up to 6 months follow-up, although effects on gingival health and dental caries were mixed. The second review could not be graded for certainty of evidence due to its lack of a risk of bias assessment.

Older adults

All three of the reviews that we examined that assessed older adult populations evaluated combined oral health education interventions incorporating training and skills acquisition delivered to older adults and/or caregivers, primarily in long-term care facilities. Findings were mixed across the reviews and represent findings from different time periods. The older of the three reviews reported moderate-certainty evidence of no difference in mean dental plaque scores or denture plaque scores between intervention and routine care groups, with inconsistent results for gingival health (low-certainty evidence). The two more recent reviews reported low- to moderate-certainty evidence of significant improvements in dental plaque scores at short-term follow-up (3–6 months), alongside improvements in denture hygiene (low- to moderate-certainty evidence). Moderate-certainty evidence from one review indicated reductions in gingivitis in the short term. Very low- to low-certainty evidence suggested the possible maintenance of effects in the longer term (up to 5 years) when periodic supervision with re-instruction and re-motivation was included, although findings were conflicting. One primary study reported very low-certainty evidence of improved oral-health-related quality of life.

The very high degree of overlap of the primary studies across these three reviews (34–44% CCA) limits the breadth of the evidence base and suggests an over-reliance on a small number of studies, with consistent findings possibly reflecting shared sources rather than independent replication.

Conclusions

Overall, the findings suggest that oral health promotion interventions may have a positive effect on oral health outcomes across the life-course; however, good-quality evidence is scarce, and the measures used in order to evaluate the effect of the interventions are diverse. The certainty of evidence was predominantly very low to moderate across all population groups and outcomes, with no outcomes supported by high-certainty evidence. Of note, the moderate-certainty findings encompass high-quality systematic reviews with findings reporting no statistically significant effect of the intervention and low or critically low-quality systematic reviews with mostly positive findings.

For maternal and early childhood populations, MI-based interventions demonstrated moderate-certainty evidence of effectiveness for early childhood caries prevention, based on two primary studies from a

critically low-quality systematic review. In addition, positive findings from the two other MI-based systematic reviews share more than a third of their primary study pool. Implementation varied in terms of the number and duration of sessions. Simple oral health education providing diet and feeding advice showed moderate-certainty evidence of slight reductions in caries risk. For children and adolescents, oral health education and training delivered in school settings by various personnel (teachers, dental health professionals, peers, and parents) showed moderate-certainty evidence of improved oral hygiene status in the short term. Oral health interventions with education and skills development showed promise for behaviour change, with peer-led programmes demonstrating particular effectiveness, albeit derived from low-quality reviews, at very low-certainty. For older adults in residential care, combined education and training approaches for caregivers and residents showed contradictory findings from different time periods, with different populations of trials. Two recent reviews reporting significant improvements in dental and denture hygiene are from low-quality systematic reviews, while an earlier higher quality review found no difference for the intervention group compared with usual routine care.

Many effective interventions were not sustained beyond the short term (3–6 months), and those that maintained effectiveness appeared to benefit from regular reinforcement and reminders. The diversity of intervention types, outcome measures, and follow-up periods, combined with methodological limitations of the included reviews and the substantial overlap of primary studies in some areas, makes it challenging to draw definitive conclusions about the most effective approaches.

There is a notable absence of evidence for the general adult population, despite adulthood being a critical period for oral health maintenance. Additionally, very little evidence assessed oral-health-related behaviours and oral-health-related quality of life across all populations, despite these being important adjuncts to overall health assessment.

1 Background

1.1 Oral health

According to the World Health Organization (WHO), oral health is defined as “a standard of health of the mouth, teeth and orofacial structures that enables individuals to perform essential functions such as eating, breathing and speaking, and encompasses psychosocial dimensions such as self-confidence, well-being and the ability to socialise and work without pain, discomfort and embarrassment” [29].

The WHO recognises that oral health serves as an important indicator of general health and quality of life [29]. Poor oral health includes a variety of diseases and conditions such as dental caries, periodontal disease, tooth loss, oral cancer, oro-dental trauma, noma, and birth defects like cleft lip and palate. Many of these oral diseases have common modifiable risk factors with the major global noncommunicable diseases (including diabetes, cardiovascular diseases, cancer, chronic respiratory diseases, and mental disorders). These risk factors consist of tobacco use, alcohol consumption, and poor diets that are high in free sugars. Many of these oral disease risk factors are related to behaviour and lifestyle and can be prevented through the promotion of oral hygiene and oral health education [29].

1.2 Oral health promotion

Health promotion empowers individuals to take greater control of their own health. It encompasses diverse social and environmental strategies that are aimed at enhancing and safeguarding people’s health and quality of life by targeting and preventing the underlying causes of illness, rather than solely concentrating on treatment and cure [30].

A public health approach to oral health promotion goes beyond the individual to embrace the social determinants of health, addressing the broader factors that influence people’s behaviour, and the social, economic and environmental conditions in which they live [17]. Guided by the WHO policy documents and the principles of the Ottawa Charter for Health Promotion [20] this approach involves enabling communities to control health determinants, addressing health inequalities and combining personal self-management with social responsibility. Key areas include supports for a coordinated effort targeting common risk factors, shared across many chronic noncommunicable diseases such as obesity, heart disease, stroke, cancers, diabetes, mental illness and oral diseases. In addition, Fischer et al., describe sustainable oral health promotion as an integral part of health and wellbeing, in order to maintain oral health throughout the life-course [31].

Oral health promotion provided by oral healthcare professionals is carried out by [32]:

- educating individuals about oral health
- providing access to preventive services
- promoting healthy behaviours that reduce oral disease.

Therefore, tailored oral health promotion is required in order to address each individual’s needs throughout life [17,31,33,34].

1.3 Policy context

Ireland’s *Smile agus Sláinte: National Oral Health Policy* was published in April 2019 [35]. The policy aims to transform Ireland’s oral healthcare system, in line with the WHO’s Global strategy and action plan on oral health 2023–2030 [36], by making services more accessible and focusing on prevention rather than just treatment. The goal is to adopt a ‘primary care approach’ in order to provide support and enable

every individual to achieve their personal best oral health. The primary care approach is outlined in the national oral health policy's three strategic strands:

1. health and oral health promotion and protection programmes
2. oral healthcare service provision
3. evaluation of oral health in the population (clinical surveillance programme).

Aligned with *Healthy Ireland: A Framework for Improved Health and Wellbeing 2013–2025* [37], the oral health promotion framework presented in *Smile agus Sláinte: National Oral Health Policy* adopts life-course and common risk factor approaches (Figure 1). This alignment is crucial, because surveys carried out by Healthy Ireland demonstrate that poor oral health negatively impacts on quality of life across all ages [38].

Oral health promotion enables a shift from acute intervention to preventive care, which is particularly beneficial to poor and marginalised populations, who are disproportionately affected by dental disease. This requires action at multiple levels: supportive regulatory and health policies (such as water fluoridation) in order to optimise the environment for oral health, alongside targeted community- and national-level oral health promotion programmes that prioritise socioeconomically disadvantaged areas – both rural and urban – and reach people from birth to old age.

The Making Every Contact Count (MECC) behavioural change programme [39] is one mechanism through which the Healthy Ireland framework is being implemented throughout the health service. It is a behaviour change framework that aims to use everyday health professional–patient interactions in order to support health behaviour change. In the context of oral health, it enables public health workers, pharmacists, general practitioners, and practice nurses to communicate key oral health messages focusing on diet, tobacco use, and alcohol consumption.

Three of the 41 actions outlined in *Smile agus Sláinte: National Oral Health Policy* specifically relate to oral health promotion:

1. Action 5: To develop oral health promotion programmes for vulnerable groups in line with the Healthy Ireland framework.
2. Action 7: To develop targeted oral health promotion programmes for socioeconomically disadvantaged areas.
3. Action 8: To develop health promotion programmes focused on improving oral health throughout life [35].

Prevention and support



Figure 1: Optimising oral health through a supportive, enabling environment. *Smile agus Sláinte: National Oral Health Policy*

Source: Department of Health, 2019 [35 p73]

1.4 Research question

The purpose of this overview of reviews is to present the Department of Health in Ireland with evidence to inform decision-making as to precisely what types of oral health promotion programmes should be provided in order to shift the emphasis from acute care and intervention-focused care to preventive care. Hence, the overarching research question asks:

What is the evidence regarding the effectiveness of population-based oral health promotion programmes to prevent oral disease and improve oral health?

1.4.1 Objectives

The primary objective of this overview of reviews is to provide a comprehensive overview of the evidence for oral health promotion programmes that aim to promote personal skills development and/or create supportive environments throughout the life-course. This will enable us to address the following objectives:

- Summarise the available systematic review evidence for oral health promotion interventions on outcomes of improved oral health status, oral self-care behaviours, and oral-health-related quality of life.
- Highlight where published systematic reviews overlap by including the same primary studies in multiple systematic reviews.
- Determine the quantity and quality of evidence by synthesising the results of identified primary studies and assigning a Grading of Recommendations Assessment, Development, and Evaluation (GRADE) rating based on the available evidence for each outcome.
- Provide a best-evidence synthesis where possible.

The Department of Health will use the findings of this overview to inform the development of oral health promotion programmes at community and national levels, in order to support the packages of care provided to each individual from birth to old age as an intrinsic part of their one-to-one oral healthcare. Our overview is a sister review to two previous HRB overviews, one of which examined the effect of artificial community water fluoridation on dental health [40] and a second that examined the primary prevention of dental caries [41].

2 Methods

2.1 Research design

In our scoping searches of the literature, we identified existing systematic reviews and research syntheses in oral health promotion that were relevant to our research question. The available reviews often employed different methodologies, implemented different criteria, varied in conduct, and comprised both Cochrane and non-Cochrane reviews. Some identified reviews included only studies in which the intervention focused on educational or behavioural components, often targeting specific populations, while others included varying combinations of these components. In order to guide policy decisions as to precisely what types of oral health promotion programmes are effective and can be used, there is a need to systematically and comprehensively bring together current evidence in a structured and consistent manner. Therefore, we decided to perform an overview of reviews. However, the overview cannot substitute for primary programme evaluation and should be read alongside the AMSTAR-2 quality ratings when interpreting any specific intervention finding.

According to Aromataris *et al.*, “if current, multiple, good quality, systematic reviews exist about a given topic or question, any reviewer should reconsider the need to conduct yet another review addressing the same issue. Rather, these [existing reviews] may be the basis to conduct an umbrella review [overview of reviews] and summarize or synthesise the findings of systematic reviews already available” [42 p366].

Since 2024 there has been consensus on the parameters of an overview of reviews that outlines five key elements [43]:

1. It contains a clearly formulated objective designed to answer a specific research question, typically about a healthcare intervention.
2. It intends to search for and include only systematic reviews (with or without meta-analyses).
3. It uses explicit and reproducible methods in order to identify multiple systematic reviews that meet the overview of reviews’ inclusion criteria and assess the quality/risk of bias of these systematic reviews.
4. It intends to collect, analyse, and present the following data from included systematic reviews: descriptive characteristics of the systematic reviews and their included primary studies; risk of bias of

primary studies; quantitative outcome data; and certainty of evidence for predefined, clinically important outcomes.

5. It discusses findings as they relate to the purpose, objective(s), and specific research question(s) of the overview of reviews, including: a summary of main results, overall completeness and applicability of evidence, quality of evidence, potential biases in the overview process, and agreements and/or disagreements with other studies and/or reviews.

Our approach to undertaking this overview of reviews was based on guidance published by Gates *et al.* that includes important pointers on anticipating and addressing the main challenges posed for reviewers when embarking on an overview of reviews [44]. We prepared a full protocol, which we registered in advance on PROSPERO, the international prospective register of systematic reviews (reference number: CRD420251173490) [45]. We have reported our review in accordance with the Preferred Reporting Items for Overviews of Reviews (PRIOR) statement and checklist (Appendix A) [46]. These reporting guidelines provide greater transparency on the reported research findings, thus increasing their value and impact.

2.2 Overlapping reviews

One of the main methodological challenges when conducting an overview of reviews is accounting for the overlap of primary studies across the included systematic reviews [47]. Overlapping systematic reviews may present discordant results or they may present similar data in different ways (e.g. different summary measures), and it can be complex and time-consuming to ensure that data from single studies are not over-represented [44]. Pieper *et al.* contended that authors of overviews of reviews should both analyse and report the overlap of primary studies by default, even when the overlap is small and unlikely to impact on the conclusions of the review, in order to avoid misleading consumers of the research [21]. While no universally accepted threshold exists, tools like the corrected covered area (CCA) quantify overlap by calculating the proportion of shared studies and classifying overlap as minimal (<5%), moderate (5–10%), or high (>10%) [48]. According to Pollock *et al.*, when planning to undertake an overview of reviews, authors should consider how primary study overlap across the identified reviews will be addressed and reported [49]. In order to address this issue in our review, we have used the Graphical Representation of Overlap for OVERviews (GROOVE) tool in order to automatically calculate the CCA for a whole matrix of evidence and graphically display the overlap in an easy-to-read figure [47]. In our utilisation of the GROOVE tool we have chosen to consistently report the five-band system rather than the three-band classification, when quantifying the overlap: none (0%), slight (1–5%), moderate (6–10%), high (11–15%), very high ($\geq 15\%$) [50]. Using both the CCA and the GROOVE tool improves the identification and management of overlap, helping researchers to detect patterns of shared studies across reviews and ensuring that the synthesised evidence remains accurate, robust, and free from bias [51].

2.3 Eligibility criteria

We developed our eligibility criteria using the population, intervention, comparator, outcomes, and study design (PICOS) framework [52 p8-9], as presented in Table 1. The population of interest was the general population, including people of any age, with or without specific health conditions (e.g. diabetes) that put them at high risk of poor oral health. The interventions of interest included oral health promotion programmes directed at individuals, healthcare professionals, and/or carers (family/formal carers) to help prevent oral disease and promote better oral health. The comparator was usual care or no intervention, or any alternative intervention. For this review, we understand population-based interventions to be those that are geographic-targeting (targeting specific settings such as schools or nursing homes) or that have a directed-population approach (targeting specific population cohorts such as older people or pregnant women), and that focus on targeted oral health promotion programmes that can be provided by

dental health professionals, non-oral health professionals, supportive care providers, and caregivers as part of one-to-one oral healthcare provision.

We nominated a broad set of a priori outcomes at the outset that had been reported in the individuals that the intervention aimed to affect and that included oral health status, oral health behaviours, and oral-health-related quality of life, so as not to exclude any relevant outcomes that were examined in the literature. As our study design was that of an overview of reviews, we included systematic reviews of trials and/or prospective longitudinal cohort study designs. We made this choice because randomised controlled trials are regarded as the gold standard trial methodology for evaluating the effectiveness of interventions and trials, and prospective cohort studies are studies that offer evidence for causality or possible causality; prospective cohort studies typically present outcomes over a longer time period than trial designs. We only included systematic reviews that analysed and presented data separately for different study designs so that it was possible for us to extract data by study design of interest. We determined to deal with systematic review overlap across included systematic reviews that met our criteria, irrespective of overlap at data extraction [53].

We assigned a publication date limit in order to include reviews published from January 2015 with no end date restrictions, based on the Joanna Briggs Institute (JBI) guidance for overviews of reviews: “Essentially searching for the research syntheses conducted within the last five to ten years will yield original/primary research conducted 30+ years prior that has been included in the located reviews and research syntheses” [42 p375]. We did not impose any English or other language limitations on the search. Systematic reviews that met the stated eligibility criteria detailed in Table 1 were considered for inclusion.

Table 1: Eligibility criteria

Domain	Inclusion criteria	Exclusion criteria
Population	General population: Children, adolescents, adults, pregnant women and new mothers, and elderly people	Humans with a specific documented oral/systemic disease/disability requiring specialised oral health promotion strategies Animal studies
Intervention	<p>Oral health promotion programmes (primary prevention) that aim to develop personal oral health skills: health education and advice using any methods (oral, leaflets, digital/video), instruction, demonstration, and/or supervision of the use of toothpastes, toothbrushes, mouth rinses, interdental cleaning aids, plaque disclosing agents, denture cleaners and fixatives, and saliva substitutes</p> <p>Oral health promotion programmes (primary prevention) that aim to create supportive environments by addressing common risk factors such as interventions targeting diet and sugar intake, smoking cessation, alcohol consumption, health literacy, scheduled appointment attendance, and clarifying opportunities to make changes conducive to health</p>	<p>Oral health promotion programmes aimed at secondary prevention</p> <p>General upstream oral-health-promoting policy strategies (such as community water fluoridation programmes; sugar taxes)</p> <p>Mass media oral health promotion campaigns</p> <p>Individual-based prevention treatments (such as topical fluoride or other chemicals; sealants)</p>
Comparator	Usual practice/no intervention, alternative oral or non-oral health intervention(s)	Studies with no comparator(s)
Outcome(s)	<p>Primary outcomes (as defined by systematic review authors) of any measurable indicators of oral health, reported in the individuals that the intervention is aiming to affect:</p> <ul style="list-style-type: none"> oral health status, such as bleeding; gingival health; plaque; decayed, missing/extracted, and filled primary and permanent teeth (dmft/DMFT); decayed, missing, and filled primary and permanent surfaces (dmfs/DMFS); reduced incidence of crown or root caries; periodontal disease; oral cancer; tooth wear; dry mouth; mouth ulcers; cold sores; tooth sensitivity; and halitosis (bad breath) oral-health-related behaviours, such as brushing, flossing, skills, competency, and ability 	Secondary outcomes as defined by systematic review authors

Domain	Inclusion criteria	Exclusion criteria
	<ul style="list-style-type: none"> oral-health-related quality of life, such as loss of school/workdays, loss of confidence, and loss of employment. 	
Study design	Systematic reviews of trials (with or without meta-analyses) and/or systematic reviews of prospective longitudinal cohort studies	<p>Systematic reviews of qualitative or mixed methods studies, case-control studies, retrospective cohort studies, case series studies, or cross-sectional studies</p> <p>Systematic reviews with inadequate or absent population, intervention, comparator, and outcomes (PICO), inadequate or absent literature search, and inadequate or absent risk of bias assessment/quality assessment</p> <p>Systematic reviews that include but do not analyse and present data separately by different study designs, making extraction of data by the study design of interest not possible</p> <p>Overviews of reviews</p> <p>Realist reviews</p> <p>Scoping reviews</p> <p>Mapping reviews</p> <p>Conference proceedings</p> <p>Abstracts</p> <p>Systematic review protocols</p> <p>Grey literature</p> <p>Primary studies</p>
Publication date	2015–2026	Pre-2015
Language	No restriction	

2.4 Search methods

2.4.1 Search approach

For this overview of reviews, we employed a multi-stage search approach. The first stage of the search, which was carried out from 15 to 18 August 2025, involved literature searches using bibliographic databases that focused on health and social care topics, including those specifically indexing systematic reviews. In the second stage, carried out between 12 November and 2 December 2025, supplemental searches (forward and backward citation chasing and grey literature searches) were combined with a set of updated searches using bibliographic databases, with the purpose of capturing relevant reviews that had been published since the first stage of the search process.

2.4.2 Search concepts

The search concepts used in the literature searches were based around the research question described in Section 1.4. The two core concepts included in the search were ‘oral health’ and ‘health promotion’ (Figure 2). Multiple relevant search terms and phrase variants were sourced for each concept, and the two sets of terms were combined where possible (depending on the technical specifics available in each search resource). The core concept of ‘oral health’ was expanded to include terminology relating to oral or dental health, dental caries, teeth, and measures of oral health (e.g. ‘dmft’, ‘dmfs’). Similarly, the core concept of ‘health promotion’ was expanded to include search terms relating to health campaigns, health behaviour change, educational initiatives, and similar terms. The search term variants that we used can be examined in the search strategies in Appendix B. In addition to these core concepts, study design and publication date were incorporated where possible as search limits (see Section 2.4.3).

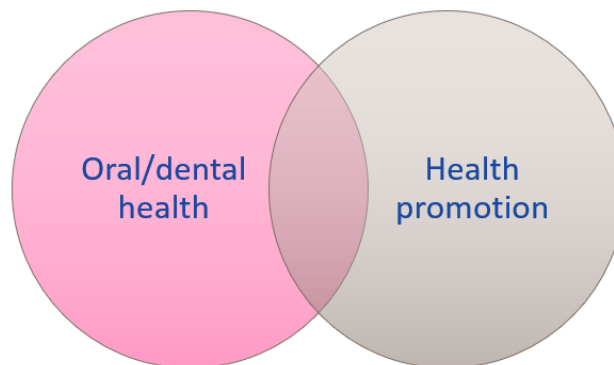


Figure 2: Search concepts

The outcomes specified in the PICOS for this overview of reviews were not employed as search concepts in the literature search. In the *Cochrane Handbook for Systematic Reviews of Interventions*, the authors note that “It is usually unnecessary, however, and may even be undesirable, to search on every aspect of the review’s clinical question” [54,55]. This is because the terms relating to the outcomes of a study may not appear in the title, abstract, or other searchable fields indexed in bibliographic databases. Thus, using these terms as an additional search concept would only capture research where those specific terms are indexed, but could risk missing relevant research with poorly written or poorly indexed abstracts, where the relevant terms are present in the full text or body of the works but not in the title or abstract, or where they are mentioned in the abstract but using top-level descriptors (e.g. ‘changes in oral health’) rather than the specific descriptors included in the PICOS (e.g. ‘dmft’, ‘flossing’) [54,55].

2.4.3 Search limits

The use of search limits in a literature search should be done with caution, given the complexity of database capacity, issues with data and metadata, the variety of the literature, and the risk of excluding relevant research in error [56–58]. The search limits that we used for this literature search, where possible, were the publication date (2015–2025) and the study design (systematic reviews). For well-established bibliographic databases, we incorporated these limits into the search. For other search resources in which complex searching is not possible or indexed fields are not used (such as search engines), we did not employ limits for the literature search, as this risked inappropriately removing relevant results. For example, publication dates may be incorrectly identified for a paper or may be conflated with upload dates in Google search results. Searching only for specific dates in such resources may not capture results where the date is incorrectly noted in a record or where multiple dates are available within a record.

The type of study of interest for our overview of reviews is systematic reviews, and the unit of analysis is completed research syntheses [42 p374]. However, the term ‘review’ encompasses many types of reviews [59], not all of which are suitable for contributing meaningful data to the analysis in this overview. For bibliographic databases, search limits or filters are available for many study designs, and we used these where appropriate [60]. For example, with the Ovid APA PsycInfo database, the Canadian Drug Agency’s Ovid PsycInfo systematic review search filter was used. After testing, the search field ‘ti,ab,kf’ in the published version was changed to ‘mp’ or ‘multi-purpose search’, as ‘kf’ was not an effective field code in the version of PsycInfo used. The search terms ‘(systematic review or meta-analysis).pt.’ was also changed to ‘(systematic review or meta-analysis).mp’ as (systematic review or meta-analysis) as a publication type (pt) did not return records. [61] For EBSCO CINAHL, the Canadian Drug Agency’s Systematic reviews, Meta-analyses, Health technology assessments, Indirect treatment comparisons search filter, published in 2023 and with pragmatic validation, was used. This filter was adapted for use in EBSCO SocINDEX, removing the field codes specific to CINAHL [62]. The Canadian Health Librarians Association Literature reviews and meta-analysis search filter, published in 2018 and included the noted updates in 2025, was used for EBSCO MEDLINE [63]. For less structured search resources, such as search engines, we included terminology relating to reviews where relevant. Full search strategies are available in Appendix B.

We used a date limit in the literature searches, at least within those search resources that allow for this. The JBI guidance on conducting umbrella (overview) reviews suggests using a 10-year date limit in the literature search. In the case of this review, we employed a start date of 2015. In line with the 10-year date limit, the end date limit was nominally given as 2025. However, as journals regularly publish ‘ahead of print’ or ‘in process’ articles with publication dates beyond the current date, the publication date limit was, in effect, from 2015 to the most recently available dates within each database (typically 2025, 2026, or 2027). With this limit, we expanded the search to capture evidence syntheses whose included primary studies may have been published from 2025 to potentially 30 years previously. We did not set a date limit on the primary studies to be included [42 p375].

We did not employ any language limits or subject age limits within the search strategies.

2.4.4 Information resources

We included a comprehensive range of search resources in the literature search, including systematic review resources, biomedical/clinical/social and public health literature databases, grey literature resources, search engines, and preprint and review protocol resources.

The first stage of the literature search was conducted from 15 to 18 August 2025 and included 15 search resources (databases and repositories). As the key study design for this umbrella review is systematic

reviews, the resources planned for the literature searches for this review included a range of databases that focus on capturing systematic reviews (Table 2). While known to be a key review resource, the Centre for Reviews and Dissemination’s Database of Abstracts of Reviews of Effects (DARE) was not included, as final searches for that database were carried out in 2014, which put the reviews indexed in that resource beyond the date limits of this review. We included the systematic review registry PROSPERO in the primary searches (rather than being considered as part of the supplemental search). This allowed for the screening of protocols for relevancy, and any protocols identified as relevant during the screening of these search results were then forwarded to the supplemental search for follow-up.

Table 2: Review-related search resources

Review-related search resources
Agency for Healthcare Research and Quality’s Systematic Review Data Repository (AHRQ SRDR)
Campbell Systematic Reviews by the Campbell Collaboration
Cochrane Database of Systematic Reviews (CDSR)
Epistemonikos
Evidence for Policy & Practice Information Centre Database of Promoting Health Effectiveness Reviews (EPPI DoPHER)
Health Evidence
International Health Technology Assessment (HTA) Database
Joanna Briggs Institute Evidence Synthesis
PROSPERO

In order to complement these systematic review resources and to maximise the opportunity to capture reviews outside of those resources, we also included a set of bibliographic databases. The databases that we examined were chosen to capture psychological and sociological research as well as biomedical research (Table 3).

Although many of these databases include a wide range of sources (including non-English research), they may focus primarily on research published in the English language. Given the time frame of this project, it was beyond the remit of our searches to capture all available relevant non-English-language research. However, the inclusion of the Scientific Electronic Library Online (SciELO) database and the Latin American and Caribbean Center on Health Sciences Information (Biblioteca Regional de Medicina: BIREME) Virtual Health Library platform (which includes databases such as Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS) and the Bibliografia Brasileira de Odontologia (BBO)) was expected to capture literature from Central and South America, as well as Spain and Portugal. The use of search engines as search resources, including the use of non-English-language search terms, should also capture international research on the review topic. However, it was beyond the remit and time frame of the review to examine and synthesise all potential non-English resources for relevant research. Non-English papers that we considered to be relevant, but which unfortunately could not be included in the quality appraisal and data extraction process, were recorded and excluded with a relevant screening code (‘Exclude on non-English paper’) during the screening process. The team had access to translation software (DeepL Translate), but although we believed that the software was adequate for providing us with an understanding of the broad concepts of a relevant paper, it was not adequate for our purpose of undertaking a complex quality assessment and data extraction process. The software translation would in effect be a paraphrasing of the original text rather than a professional translation, and it would not be appropriate to assess and extract a paraphrase as an accurate representation of the original text. A translation that used such software may not return the meaning intended by the original authors, and it

may not capture implied meanings. The translation may also not be exactly replicable by other users. Translation software may not incorporate specialised technical and biomedical language (in addition to standard ‘conversational’ language) in order to adequately capture nuances in complex research, even with the use of large language models [64], and it may not include adequate complex translation capacity for all languages, including ‘minority’ languages. Where an officially translated version of a non-English paper existed, this official translation was assessed and extracted.

Table 3: Bibliographic databases and resources

Bibliographic databases and resources (clinical/psychological/sociological/international)
Biblioteca Regional de Medicina: BIREME Virtual Health Library platform
EBSCO CINAHL
EBSCO MEDLINE
EBSCO SocINDEX
Ovid APA PsycInfo
Scientific Electronic Library Online: SciELO

We carried out the second stage of the literature search between 12 November and 2 December 2025, following the selection of a set of included papers from the full-text screening of the primary search records. It included nine search resources, as well as follow-up of relevant citations, references, and review protocols. A key part of the supplemental search process was capturing the reference lists/bibliographies of the included articles (backward citation chasing) and articles that have cited the included articles (forward citation chasing) [65,66]. The supplemental search also included the follow-up of review protocols identified in the primary searches (for example, from PROSPERO or indexed in MEDLINE). We also identified a number of umbrella reviews on similar topics to this evidence review during the primary search, and the references from these reviews were sourced for screening at this stage [67–74].

In addition to citation searching, we included search engines and preprint registries as supplemental resources in order to capture papers that are not indexed in databases, or where the information relevant to this review is not included in the indexed/searchable fields of databases [75,76] (Table 4).

In the review protocol, we noted that the search would include three stages, with the third and final ‘update’ search stage to be carried out close to the end of the review process. As the supplemental searches were carried out in November and December of 2025 (close to the end date for the review), we decided to conduct this update search during the same period of time rather than conducting it at a later date. In this stage, we searched EBSCO MEDLINE and Epistemonikos for any recently published relevant reviews. Search resources, search dates, and results are presented in Appendix B.

Table 4: Supplemental searches

Supplemental searches
Forward citation searching of included papers from primary searches and screening
Backward citation searching of included papers from primary searches and screening
Follow-up of protocols identified during primary results screening
Follow-up of identified umbrella review references
Preprint resource: medRxiv/bioRxiv
Preprint resource: Open Science Framework (OSF.io)
Preprint resource: Research Square

Supplemental searches

Search engine: Bielefeld Academic Search Engine (BASE)

Search engine: DuckDuckGo

Search engine: Google Scholar

Search resource: Grey Matters (Canada's Drug Agency)

Follow-up database search: MEDLINE

Follow-up database search: Epistemonikos

2.4.5 Search strategies

The completed search strategies and search dates for the databases and other search resources that we used are presented in Appendix B. We used controlled vocabulary for databases where available and appropriate; for example, the Medical Subject Headings (MeSH) thesaurus for MEDLINE [77], Cumulative Index to Nursing and Allied Health Literature (CINAHL) Headings for CINAHL, and the Thesaurus of Psychological Index Terms for APA PsycInfo. We used PubReMiner, the PubMed query-building and text-mining tool, in order to source additional terminology for MEDLINE [78]. The search strategy was peer-reviewed by another information specialist, as per the Peer Review of Electronic Search Strategies (PRESS) guidance [79].

2.5 Study selection

Throughout all stages of the study selection, any screening conflicts in the double-screening process were resolved by discussion or by referral to a third reviewer if required.

2.5.1 Title and abstract screening

We exported and downloaded the search results into EPPI-Reviewer [80,81], the systematic review software management, as .ris files for further assessment and management. Two systematic reviewers (PH and TM) independently conducted screening for inclusion on title and abstract according to the eligibility criteria outlined in Table 5 based on our review's PICOS components. As title and abstract screening can be especially time-consuming, we employed the active machine-learning enhanced 'priority screening' function in EPPI-Reviewer in order to expedite the screening process. We used priority screening in order to identify the most relevant records first. Records were sorted in order of likelihood of inclusion, following Hamel *et al.*'s approach and guidance on the use of artificial intelligence for title and abstract screening while conducting knowledge syntheses [82]. With the priority screening system, the EPPI-Reviewer algorithm detects patterns in the available records during the initial training period of the screening process. After training, the system presents records that are calculated by the algorithm to be highly relevant to the screeners early in the screening process. This process allows the researchers to switch from double-screening to single- (also known as normal-screening) mode once it becomes clear that the likelihood of finding relevant records is extremely low and only out-of-scope records remain. This approach can be useful for screening large numbers of records. However, in the current overview case, no 'stopping point' for double-screening was used, and all papers were double-screened in the title and abstract screening process by human reviewers. This type of artificial intelligence uses machine-learning techniques but is not a generative artificial intelligence system [83,84]. A graph of the priority screening progress indicating the switch point from 'random' to 'priority' screening and showing the high inclusion rate at the beginning and 'plateau' of inclusions later in the process is available in Appendix C.

The reasons for exclusion from this review were based on the review eligibility criteria as listed in the PICOS. They included study type, population, intervention, comparator, outcome, and publication date. Reason(s) for exclusion were recorded for any abstracts that we excluded during this first stage. A

category of exclusion for systematic review protocols was indicated (Table 5). These protocols were out of scope, as they are not systematic reviews, and these records were excluded from the synthesis. However, relevant systematic review protocol records were set aside and followed up in the supplemental searches in order to capture any related published reviews.

Table 5: Title and abstract screening codes

Title and abstract screening codes
INCLUDE on title and abstract
EXCLUDE on population
EXCLUDE on intervention
EXCLUDE on comparator
EXCLUDE on outcome
EXCLUDE on study design
EXCLUDE on publication date (pre-2015)
EXCLUDE on relevant systematic review protocol

We carried out screening for duplicate records separately after title and abstract searching was concluded, rather than using ‘Exclude on duplicate’ as an exclusion code. This was done in order to ensure that no items were excluded in error as duplicates, as at the title and abstract stage of screening, complete information was frequently not available for the records. They may have been missing data such as digital object identifier (DOI) numbers, complete author information, or page numbers. Records with similar titles and authors may have appeared as duplicates to be excluded, but on examination of the full text, were similar but not duplicates. In addition, when using EPPI-Reviewer priority screening, items cannot be sorted by title or author prior to screening, as the algorithm selects items to present for screening to the researchers on relevance alone, so direct comparison of items was not facilitated.

2.5.2 Full-text screening

The full text of records identified for full-text screening by the search strategy at the title and abstract screening stage was screened for inclusion independently by two reviewers. In addition to the standard exclusion criteria based on the PICOS eligibility criteria, we employed exclusion codes relating to three domains of an adapted version of the AMSTAR 2 (A MeaSurement Tool to Assess systematic Reviews, Version 2) quality assessment criteria: inadequate or absent PICO, inadequate or absent literature search (fewer than two databases searched), and inadequate or absent risk of bias assessment/quality assessment (Table 6).

Table 6: Full-text screening codes

Full-text screening codes
INCLUDE on full study
EXCLUDE on population
EXCLUDE on intervention
EXCLUDE on comparator
EXCLUDE on outcome
EXCLUDE on study design
EXCLUDE on publication date (pre-2015)
EXCLUDE on AMSTAR: inadequate or absent PICO
EXCLUDE on AMSTAR: inadequate or absent literature search

Full-text screening codes

EXCLUDE on AMSTAR: inadequate or absent risk of bias assessment/quality assessment

EXCLUDE on empty review

2.5.3 Screening of supplemental search results

We screened the results of the supplemental searches by title and abstract, and then by full text, in EPPI-Reviewer using the same screening codes as for the primary search results screening. A Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flow diagram outlining the information flow through the search and screening process is available in Section 3.1 [85].

During the data extraction process described in Section 2.6, it became clear on close reading that a number of papers included at the full-text screening stage did not meet the criteria for inclusion. Such papers were examined by two researchers (PH and TM), and a decision was made to exclude those papers after discussion. The decisions for any of the papers that were excluded at this stage were recorded as screening decisions in EPPI-Reviewer and on the PRISMA flow diagram.

2.6 Data extraction

We used an amended version of the JBI data extraction form for systematic reviews and research syntheses (Appendix D) in order to extract data from each included systematic review. Data were extracted at the level of the included systematic reviews only, not at the level of the primary studies included therein. In order to minimise bias and errors, data extraction was performed by one reviewer and checked by a second (PH, TM). We anticipated discrepancies across overlapping systematic reviews due to differences in eligibility criteria, analytic approaches, and reporting practices of the included systematic reviews. When discrepancies were noted, we extracted and reported narratively any alternative estimates and results.

2.6.1 Variables

We extracted and documented the following data in tabular format:

- citation details
- objectives of the review
- participants
- providers of the intervention
- setting
- interventions and comparators
- search information
- primary study date range
- number of primary studies
- study design
- risk of bias tool used
- risk of bias assessment
- analysis methods

- outcomes assessed
- results by primary outcomes
- commentary on bias, heterogeneity, and use of Grading of Recommendations Assessment, Development, and Evaluation (GRADE)
- overall findings.

We did not reassess the risk of bias of included primary studies within the reviews, but instead extracted all assessment data and reported this according to the review authors' assessment.

2.6.2 Methodological quality assessment

We used an adapted version of the AMSTAR 2 quality assessment tool in order to assess the quality and risk of bias of all systematic reviews that met our inclusion criteria [86]. The 16-item AMSTAR 2 instrument has been used in previous Health Research Board (HRB) evidence reviews and allows for the appraisal of systematic reviews of both randomised and non-randomised studies of healthcare interventions. Adjustments to the original instrument that HRB reviewers made in previous overviews provided more explicit guidance while retaining the original text, adding text where needed in order to further explain what is required and adjusting the scoring in order to provide more stringent judgement [41,87]. In accordance with our eligibility criteria, we excluded systematic reviews with inadequate or absent PICO components (item 1), reviews that did not report a comprehensive literature search strategy (item 4), and reviews that did not include a full assessment of bias (item 9). The adapted AMSTAR 2 instrument is included in Appendix E. Two reviewers (PH and TM) each applied the adapted version of the AMSTAR 2 instrument in order to assess each full-text review. Any differences between reviewer validations were resolved through discussion and consensus.

The AMSTAR 2 instrument does not generate an overall quality score; instead, an overall rating can be applied based on weaknesses in critical domains that can affect the validity of the review. Shea *et al.* [86] recommend that reviewers define the critical domains prior to commencing appraisal and suggest seven domains:

1. protocol registered before commencement of the review (item 2)
2. adequacy of the literature search (item 4)
3. justification for excluding individual studies (item 7)
4. risk of bias from individual studies being included in the review (item 9)
5. appropriateness of meta-analytical methods (item 11)
6. consideration of risk of bias when interpreting the results of the review (item 13)
7. assessment of presence and likely impact of publication bias (item 15).

In our overview, we selected all seven domains, as recommended, and assigned an overall quality rating for each systematic review with a score of high, moderate, low, or critically low using the schema suggested by Shea *et al.* [86] shown in Table 7. Any quality appraisal conflicts were resolved by discussion or by referral to a third reviewer when required.

Table 7: Rating scale of overall quality of review

Score	Criteria
High	No or one non-critical weakness: The systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest.

Score	Criteria
Moderate	More than one non-critical weakness:* The systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review.
Low	One critical flaw with or without non-critical weaknesses: The review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest.
Critically low	More than one critical flaw with or without non-critical weaknesses: The review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies.
*Downgrade	*Multiple non-critical weaknesses may diminish confidence in the review, and it may be appropriate to move the overall appraisal down from moderate to low confidence.

2.7 Data synthesis

The unit of analysis for this overview was systematic reviews, not individual trials. A best-evidence synthesis relating to meta-analyses conducted and reported in outcomes of interest to this overview was compiled from the included systematic reviews where possible.

2.7.1 Presenting descriptive data

We have presented descriptive data in enough detail to facilitate an effective summary of the overall evidence provided in the included reviews. We have provided a detailed tabular presentation of the extracted review- and trial-level information containing the characteristics of included reviews, such as the number of trials included, participants, intervention(s), control description, and limitations. We have tabulated review-level summaries for all outcomes of interest from each included review. Gates *et al.* specified that “descriptive characteristics of the systematic reviews should be presented narratively and/or in a table in adequate detail to support each systematic review’s inclusion in the overview of reviews and inform the applicability of their findings” [44].

2.7.2 Presenting outcome data

The outcomes identified a priori were intentionally wide-ranging in order to ensure that we did not exclude any relevant outcomes that were examined in the literature. As noted by Lunny *et al.*, “Overviews are typically broader in scope than systematic reviews and may examine different interventions for the same condition, the same intervention for different conditions, or the same intervention for the same condition but focusing on different outcomes” [53]. This may result in there being inconsistencies in methodologies and reporting outcomes across the included systematic reviews, leading to difficulties when collecting, analysing, and presenting findings [44]. For example, the included systematic reviews and their primary studies used a range of heterogeneous outcome measures that limited our ability to draw useful conclusions. Where possible, we have documented how the included systematic review authors handled the different tools/indices that they used to measure the different outcomes.

2.7.3 Best-evidence synthesis

The Cochrane Collaboration recommends using the GRADE framework to facilitate the transparent rating of the certainty of evidence for systematic reviews [88]. The GRADE approach has been traditionally applied to rating the certainty of evidence in single systematic review outcomes, primarily for reviews that include a meta-analysis. GRADE provides a structured approach for assessing the certainty of evidence at the outcome level in order to assign a rating of high, moderate, low, or very low certainty to

the outcome evidence [89]. However, there is a lack of consensus on how best to apply a GRADE assessment when undertaking an overview of reviews. Pollock *et al.* provide guidance on applying GRADE in an overview of reviews [90] and we employed this approach to assess outcomes included in our overview of reviews. According to that guidance, each review starts with a ranking of high certainty and can receive one downgrade for a serious methodological concern on any one of the GRADE criteria, or two downgrades for a very serious methodological concern on either of two GRADE criteria. Using the algorithm described, we have applied the GRADE approach across the four key criteria:

1. the number of participants within the analysis, considering imprecision based on sample size and confidence intervals around outcomes of interest (≥ 200 adequate, 100–199 serious limitations, 1–99 very serious limitations)
2. the risk of bias within the trials contributing participants to the analysis with respect to randomisation and blinding of outcome ascertainment
3. the statistical inconsistency or heterogeneity within the analysis, as determined by the I^2 statistic (high heterogeneity ($I^2 > 75\%$))
4. the methodological quality of the review as determined by the selection of critical factors from the quality assessment tool.

In addition, we added the study design to the criteria, as we have included randomised controlled trials, non-randomised trials, and cohort studies.

The number of downgrades that can be applied using the modified GRADE algorithm ranges from zero to eight (one possible downgrade on each of six criteria in the GRADE algorithm, or two possible downgrades on two of the six criteria), and these ratings can be applied within the standard GRADE level of evidence [90]. Table 8 displays the criteria that we used in order to rate the certainty of evidence in this overview of reviews.

Table 8: Classification of GRADE level of evidence in overview of reviews from number of downgrades determined using Pollock *et al.*'s modified algorithm

GRADE level of evidence	Number of downgrades (derived from objective assessment)
High	Score awarded when 0 downgrades are applied
Moderate	Score awarded when 1 or 2 downgrades are applied
Low	Score awarded when 3 or 4 downgrades are applied
Very low	Score awarded when 5 or more downgrades are applied

Source: Adapted from Pollock *et al.*, 2016 [90]

For example, we applied one downgrade to a review where inconsistency/heterogeneity was not or could not be dealt with appropriately. We applied two downgrades where there was imprecision, based on an inadequate sample size within the pooled analysis. We also applied two downgrades if review quality or risk of bias was one of the critical domains. Additionally, any outcome with evidence based on one primary study was automatically rated as very low-certainty evidence as it is not possible to assess the GRADE inconsistency domain. This approach has been applied in previous HRB overviews of systematic reviews.

All meta-analyses extracted by intervention type and outcome were rated as having a high, moderate, low, or very low certainty of evidence using the modified GRADE criteria, and the rationale for any downgrade that we applied was provided.

2.7.4 Interpreting outcome data and drawing conclusions

According to Gates *et al.*, a number of challenges persist in synthesising findings from multiple systematic reviews, including heterogeneity of outcome measures, procedural variation at the level of individual systematic reviews, multiple comparisons, and discordant results and conclusions across different systematic reviews [44].

In order to address these challenges, we used the six-item framework proposed by Lunny *et al.* to synthesise our interpretations and conclusions [91]. We therefore:

1. elaborated our interpretation and conclusions
2. summarised the results from included systematic reviews
3. assessed and reported on heterogeneity
4. assessed and reported on risk of bias in the reviews
5. assessed and reported on overlap of primary studies included in more than one systematic review
6. assessed and reported on discordant results, interpretations, and conclusions among the included reviews [91].

This overview of reviews has allowed us to summarise the quantity and quality of the evidence for oral health promotion programmes provided by oral health professionals, non-oral health professionals, supportive care providers, and peers/caregivers by intervention type and outcome.

2.8 Deviation from the published protocol

We report one deviation from our published protocol (CRD420251173490).

We introduced language restrictions at the full text screening. Our PROSPERO record and eligibility criteria stated there are no language restrictions. However, we did exclude two non-English papers at the full-text stage as we could not locate reliable English language translations for these papers, and this is a limitation to the completeness of our systematic review data.

3 Findings

In order to address the Department of Health's research question regarding the effectiveness of population-based oral health promotion programmes, and to provide a comprehensive overview of the available evidence, we employed an overview of reviews methodology. The included reviews reported on oral health promotion programmes that were directed at individuals, healthcare professionals, and/or carers (family/formal carers) to help prevent oral disease and promote better oral health.

Our overview set out to systematically evaluate the evidence for these interventions and their impact on oral health status, oral-health-related behaviours, and oral-health-related quality of life, as reported in the individuals that the interventions aimed to affect. Our outcomes of interest were related to any measurable indicators of oral health. For oral health status, a range of clinical outcomes and indices were identified: dental caries incidence, increment, and prevalence; decayed, missing (due to dental caries), or filled teeth (decayed, missing/extracted, and filled permanent teeth (DMFT) and decayed, missing/extracted, and filled primary teeth (dmft)); decayed, missing (due to dental caries), or filled teeth surfaces (decayed, missing, and filled permanent surfaces (DMFS) and decayed, missing, and filled primary surfaces (dmfs)); the International Caries Detection and Assessment System (ICDAS); the Root

Caries Index; the Simplified Oral Hygiene Index (OHI-S); the Simplified Debris Index (DI-S); the Plaque Index (PI); and the Gingival Index (GI) (all outlined in Glossary).

First, we will describe the overall search and screening results in Section 3.1. Then, we will present a general description of the included systematic reviews and our categorisation of the reported interventions in Section 3.2. Finally, we will present the review characteristics, methodological quality, certainty of evidence, overlap, and findings for each target population in Sections 3.3–3.5.

3.1 Results of search strategy

Our database searches identified 7,835 records, of which 2,485 were duplicates, leaving 5,350 records for title and abstract screening. We excluded 5,180 records on title and abstract screening, leaving 170 records for full-text screening. Following full-text screening, we excluded a further 144 records, leaving 26 records for extraction. We screened an additional 3,382 records from supplemental searches on title and abstract, resulting in 4 additional reviews being included after full-text screening. In total, 30 systematic reviews were selected for data extraction (26 from the primary search and 4 from the supplemental search). Extraction involved a more detailed reading of the reviews, at which point we excluded 8 reviews (4 from each search stage), leaving 22 systematic reviews to be included in this overview of reviews.

The PRISMA flow diagram in Figure 3 outlines the flow of information throughout the searching and screening process [85]. Details of the results from each individual part of the search process can be found in Appendix B. Details of the reviews that we excluded at full text (screening and extraction), together with the reason(s) for exclusion, are presented in Appendix C.

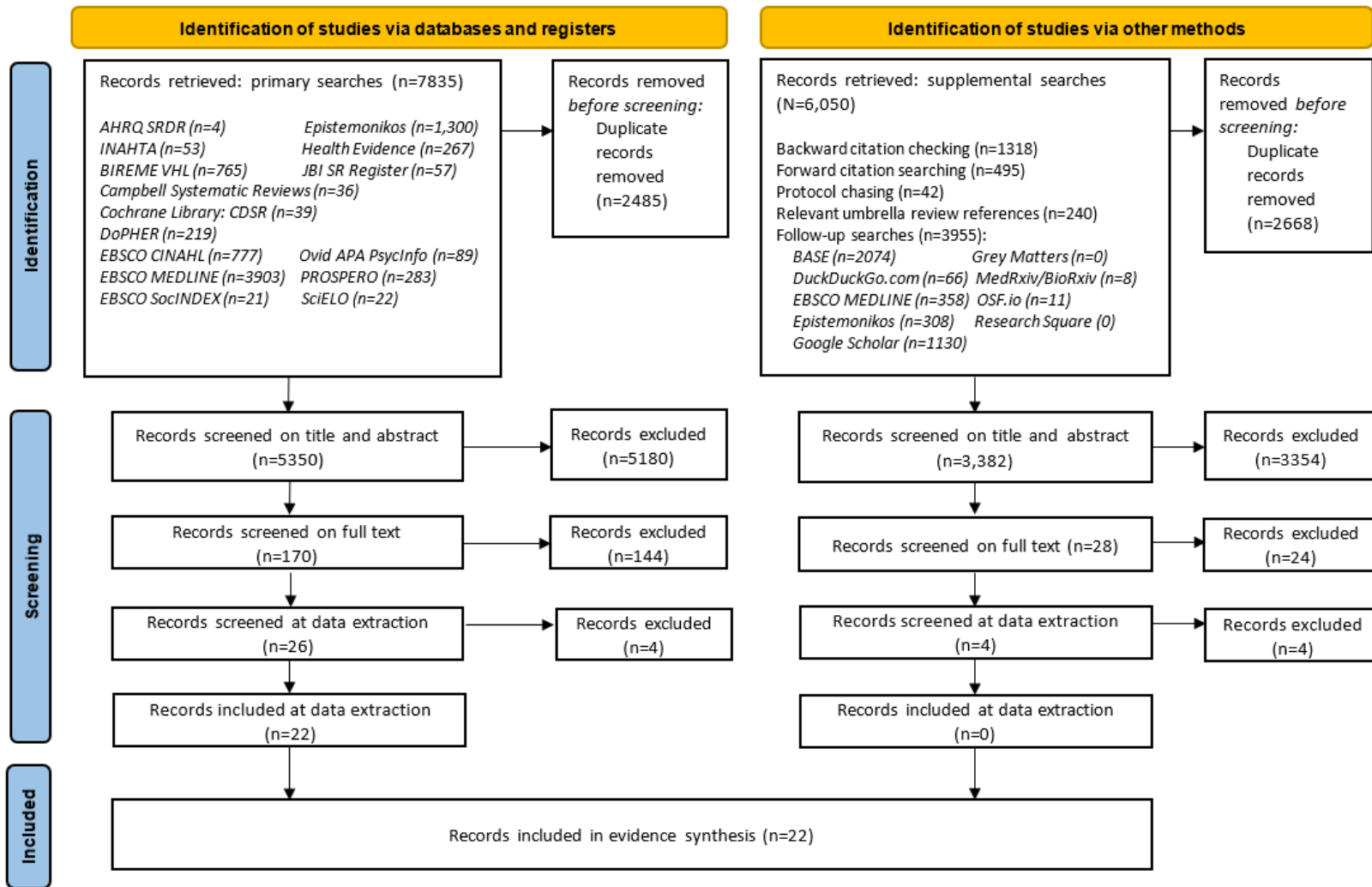


Figure 3: PRISMA flow chart

Source: Page et al., 2021 [85]

3.2 Description of included systematic reviews

The included systematic reviews were conducted between 2016 and 2025. The 22 identified systematic reviews reported on 143 primary studies. Publication dates of the included primary studies ranged from 1985 to 2022 and encompassed a wide range of countries of origin, spanning the world across Africa (Tanzania, Uganda, and Zimbabwe), the Americas (Brazil, Canada, Mexico, and the United States of America), Asia (China, Hong Kong, India, Iran, Iraq, Jordan, Pakistan, Sri Lanka, Syria, Taiwan, Thailand, Turkey, and Uzbekistan), Europe (Belarus, Belgium, Denmark, England, Finland, Germany, Greece, Lithuania, the Netherlands, Romania, Scotland, Sweden, Switzerland, the United Kingdom, and Yugoslavia), and Oceania (Australia). This collection of primary studies represents 15 member countries of the Organisation for Economic Co-operation and Development (OECD), namely Australia, Belgium, Canada, Denmark, Finland, Germany, Greece, Lithuania, Mexico, the Netherlands, Sweden, Switzerland, Turkey, the United Kingdom, and the United States of America.

We organised the systematic reviews according to the target population for oral health promotion interventions across the life-course. Our 22 included systematic reviews comprised 7 reviews targeting maternal and early childhood populations, 12 reviews targeting school-aged children and adolescents, and 3 reviews targeting older adults. We did not identify any reviews matching our eligibility criteria that targeted the general adult population. The reviews examined a variety of interventions that we broadly categorised according to the review authors' description of the interventions, the mode of delivery, and the likely components of such programmes of oral health education and promotion (Figure 4). We determined the categories through detailed data extraction, careful examination, and discussion of the interventions, as defined in each systematic review. This was an iterative process, performed as a team and informed by components described in the behaviour change literature that support desirable behaviours [92–94]. This scrutiny resulted in our description of five broad categories of interventions, each of which includes information sharing and oral health education, which enabled us to compare and contrast outcomes by intervention type (Table 9). Our categorisation of oral health education extended from the formal definition, provided in the glossary, allowed us to differentiate between common approaches to complex interventions described.

Table 9: Intervention categories

Primary mechanism	Intervention description	Intervention category label (for the review)
Information transfer	Information and knowledge sharing, guidance and advice	Simple oral health education (OHE)
Theory-informed behaviour change techniques	Included motivational interviewing and other behavioural counselling interventions, with or without training and skills acquisition	OHE + theory-based
Information transfer and training mechanisms	Included demonstrations, instruction, and action planning	OHE + training
Information transfer and skill instruction	Included hands-on practice and techniques, with or without monitoring and feedback	OHE + skills acquisition
Information transfer with training and skill instruction	Included both training and skills acquisition	OHE + combined

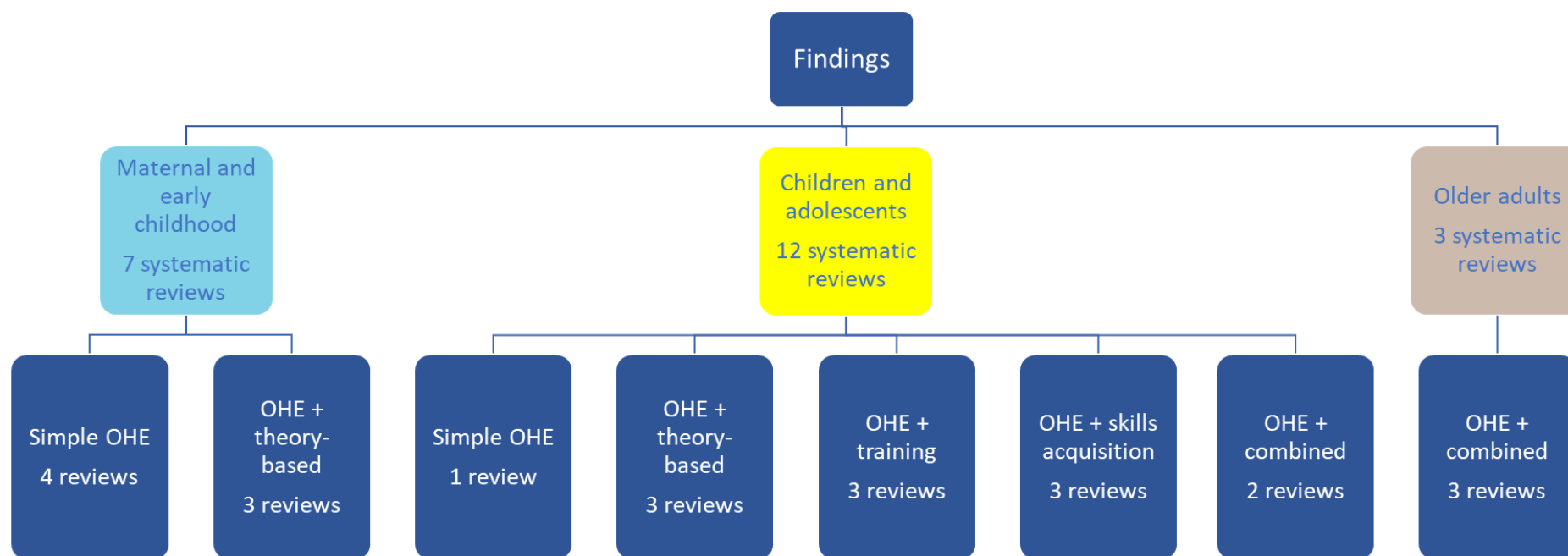


Figure 4: Included systematic reviews by intervention categories

As described in Section 2.6, we used the amended version of the JBI data extraction form for systematic reviews and research synthesis [42] (Appendix D) in order to extract data from each included systematic review. We endeavoured to include systematic reviews that identified the individual, healthcare professional, or carer who provided or delivered each primary study intervention in order to provide a comprehensive description. Not all of the primary studies included in each of the systematic reviews were deemed relevant to the focus of the current overview of reviews. The findings presented apply only to those primary studies that reported on our primary outcomes of interest, as detailed in our eligibility criteria outlined in Section 2.3. We present the characteristics (such as sample size, age, gender, country of origin, study design, intervention components, and intervention provider) of the included systematic reviews and primary studies by target population group. Some of the findings were not usable for the purposes of this overview of reviews, and these reviews are identified, where appropriate, throughout the findings section.

The evidence presented in Sections 3.3–3.5 is organised by target population, then by type of intervention (Figure 4), and then by outcome of interest (oral health status, oral-health-related behaviours, and oral-health-related quality of life). Where data were available, we described the findings from each systematic review for comparable outcomes for each target population and noted where they agreed or disagreed. We present a high-level summary of each systematic review, integrating the certainty of the evidence using the GRADE criteria, and demonstrate the overlap of primary studies evaluating similar interventions for the same outcomes across one or more systematic reviews for each target population. We provide a detailed structured summary of each systematic review in Appendix F.

3.3 What is the effectiveness of health promotion programmes (broad) targeted at maternal and early childhood

Table 10: Included systematic reviews

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
Abuhaloob et al. (2019)	Maternal and child oral health interventions in Middle East and North Africa regions: a rapid review	2	Iran	Integrated verbal oral health information	Simple OHE
Colvara et al. (2020)	Motivational interviewing for preventing early childhood caries: A systematic review and meta-analysis	10	Australia; Brazil; Canada; India; Iran; Thailand; USA	Motivational interviewing (MI) as counselling technique	OHE + theory-based
Faghihian et al. (2020)	Impact of motivational interviewing on early childhood caries: A systematic review and meta-analysis	8	Brazil; Canada; India; USA	MI-based intervention	OHE + theory-based
Gomersall et al. (2024)	Interventions with pregnant women, new mothers and other primary caregivers for preventing early childhood caries	14	Australia; Belarus; Brazil; Canada; Finland; Hong Kong;	Covers four distinct information-type interventions	Simple OHE

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
			Uganda; UK; USA		
Karande et al. (2023)	Comparative evaluation of oral health and behavior changes in children after motivational interviewing and traditional method of oral health education among mothers: a systematic review and meta-analysis	7	Brazil; India; Mexico; Thailand; USA	MI-based intervention	OHE + theory-based
Saxena et al. (2024)	Maternal oral health education for predicting early childhood caries among preschool children: a systematic review and meta-analysis	8	Australia; Brazil; Canada; India; Iran; Uganda	Information-only delivery to mothers	Simple OHE
von Helde et al. (2024)	Are educational tools in oral health programs for pregnant women effective in improving the oral status of mothers and babies? A systematic review	6	Australia; China; Iran; USA	Multiple delivery formats but all information/awareness-based	Simple OHE

3.3.1 Review characteristics

Seven systematic reviews [95–101] reported on oral health promotion and education interventions that were delivered to pregnant women, new mothers, parents, or other primary caregivers, and reported on oral health status measured as the effectiveness of early childhood dental caries prevention. One review also reported mothers' oral-health-related behaviours associated with the cleaning of their children's teeth [95], and another reported changes in the mothers' periodontal health [101]. Reviews were conducted in Brazil [96,101], India [99,100], Iran [97], and the United Kingdom [95,98]. Not all of the included systematic reviews reported the total number of participants, and as we only included primary studies with relevant outcomes of interest, we determined the total number of participants based on the number that had been reported in each included primary study. Across the 7 systematic reviews, we calculated that the total number of included participants ranged from 332 pairs of mother and child dyads (2 primary studies) to 23,973 pregnant women and new mothers of young infants (14 primary studies). The setting for the intervention was not specified in any of the reviews, nor was the gender of the babies and young children reported. The total numbers of included primary study designs (not accounting for overlap) were: 42 randomised controlled trials (RCTs), 10 cluster RCTs, and 3 non-randomised trials (NRTs). The time frame for follow-up across the trials ranged from 3 months up to when the children reached the age of 6 years.

Four of the included systematic reviews examined interventions that were categorised as simple oral health education [95,98,100,101], and three examined interventions that were categorised as theory-

based oral health education [96,97,99] (Appendix F). All three of the reviews that were categorised as theory-based oral health education interventions included primary studies that utilised motivational interviewing (MI) as an approach to oral health behaviour counselling. The remaining reviews involved the use of various educational tools, including lectures, pamphlets, videos, and one-to-one, group, or face-to-face sessions providing verbal information, with or without reinforcement or reminders. Only one review considered social media messages or interactive online chats as modes of delivery [101]. When we examined who provided the interventions, we found that it was a variety of individuals ranging from oral health and non-oral health professionals to trained local volunteers, including dentists, dental practitioners, dental hygienists, dental assistants, nurses, dieticians, nutrition teams, postnatal teams, paediatricians/family physicians, primary care staff, vaccination staff, community therapists, community health representatives, local volunteers, peer support workers, caregivers, and study investigators. One review reported that dental health professionals and caregivers delivered the interventions, but it did not specify this information by primary study [99]. Two reviews included studies that did not report on who delivered the intervention(s) [96,100].

3.3.2 Quality assessment

As outlined in Section 2.6.2, we assigned the seven critical domains in the adapted AMSTAR 2 quality assessment tool recommended by Shea *et al.* [86]. These domains include: (1) whether the protocol was established prior to the conduct of the review (item 2); (2) whether the review authors conducted a comprehensive literature search (item 4); (3) whether the review authors included a list of excluded studies and their reasons for exclusion (item 7); (4) whether the review authors used a satisfactory technique for assessing the risk of bias (RoB) in the individual studies that were included in the review (item 9); (5) whether the methods used for statistical combination of the primary study results were appropriate (item 11); (6) whether RoB was considered when interpreting the results (item 13); and (7) whether the review authors conducted an assessment of the presence and likely impact of publication bias (item 15). Of the seven included systematic reviews, only one was judged as having a high overall quality rating [98], indicating that it had no critical flaws; one was judged as having a low overall quality rating [101], indicating that it had only one critical flaw; and the remaining five reviews were judged as being of critically low quality, indicating that they had more than one critical flaw (Appendix E). The critical flaws for the critically low-quality reviews varied, with the most common critical flaws being that the review authors did not establish a protocol prior to conducting the review, did not provide a list of excluded studies and their reasons for exclusion, and did not carry out an adequate investigation of publication bias and discuss its likely impact on the results of the review. Two of the reviews completed a narrative synthesis only.

3.3.3 Certainty of evidence

The certainty of evidence, as assessed using the modified GRADE criteria [90], was determined for each extracted outcome of interest, and the number of downgrades applied and reasons for downgrading are presented in Appendix G. There were no reviews that presented outcomes without any downgrades, and therefore there were none with a high certainty of evidence. For outcomes of oral health status measured as the presence of early childhood dental caries, two reviews [98,99] presented moderate-certainty evidence, as assessed using the modified GRADE algorithm. The reasons for downgrading to moderate-certainty evidence were inadequate randomisation, inadequate blinding of outcome ascertainment, and quality rating on the adapted AMSTAR 2 instrument. Four reviews [96,97,100,101] presented low-certainty evidence. The reasons for downgrading to a low certainty of evidence included study design, inadequate randomisation, inadequate blinding of outcome ascertainment, inconsistency (high heterogeneity), and quality rating on the adapted AMSTAR 2 instrument. One of these low-certainty

reviews presented a narrative synthesis only [101]. One review [95] presented very low-certainty evidence, having been automatically downgraded as it included just a single primary study.

It is important to note that outcomes within the same review could be graded at different levels of certainty as a result of comparing various interventions, levels of intervention, or different measures of outcomes in the meta-analyses, or where the review authors presented an additional narrative synthesis (see Table 11). An example of this is the Gomersall *et al.* review, which compared different oral health education interventions (combined oral hygiene, diet and feeding practice advice; diet and feeding practice advice alone; breastfeeding promotion; and diet advice alone) with standard care and used measures of the presence of dental caries in primary teeth, dmfs, and dmft as outcome measures [98].

Table 11: Maternal and early childhood GRADE assessment

Author (year)	Intervention category	Outcome measure	GRADE rating†	Synthesis
Early childhood caries				
Abuhaloob <i>et al.</i> (2019)	Simple OHE	Increments of decayed enamel/teeth	Very low (automatically downgraded)	Single study
Colvara <i>et al.</i> (2021)	OHE + theory-based	Dental caries level (dmft/dmfs)	Low	Meta-analysis (MA)
Faghihian <i>et al.</i> (2020)	OHE + theory-based	Rates of carious, missing, or restored tooth surfaces	Low	MA
		Presence of early childhood caries	Very low	Narrative
Gomersall <i>et al.</i> (2024) (Cochrane)	Simple OHE (oral hygiene, diet, and feeding)	Dental caries presence in primary teeth	Moderate	MA
		dmfs	Moderate	MA
		dmft	Very low (automatically downgraded)	Single study
		Dental caries presence in primary teeth	Moderate	MA
		dmfs	Moderate	MA
		dmft	Very low (automatically downgraded)	Single study
	Simple OHE (breastfeeding promotion)	Dental caries presence in primary teeth	Moderate	MA
		dmft	Moderate	MA
	Simple OHE (diet only)	Dental caries presence in primary teeth	Very low (automatically downgraded)	Single study
Karande <i>et al.</i> (2023)	OHE + theory-based	ICDAS	Moderate	MA
Saxena <i>et al.</i> (2024)	Simple OHE	Early childhood caries	Low	MA
von Helde <i>et al.</i> (2024)	Simple OHE	Dental caries presence in primary teeth	Low	Narrative

Author (year)	Intervention category	Outcome measure	GRADE rating†	Synthesis
Mothers' oral health behaviour				
Abuhaloob et al. (2019)	Simple OHE	Cleaning children's teeth	Very low (automatically downgraded)	Single study
Mothers' oral health				
von Helde et al. (2024)	Simple OHE	Periodontal parameters	Low	Narrative

†GRADE certainty of evidence ratings: High, moderate, low, or very low.

3.3.4 Overlap

As outlined in Section 2.2, we addressed the issue of overlapping primary studies evaluating the same outcome of interest across the included systematic reviews by using the Graphical Representation of Overlap for OVERviews (GROOVE) tool in order to automatically calculate the corrected covered area (CCA) of overlap and then graphically display this finding in an easy-to-read figure [47]. We integrated the overlap of the included primary studies in the high-level summaries of evidence for each outcome of interest reported in Section 3.3.5. Across the 7 included systematic reviews, 20 primary studies reported measures of early childhood caries. A matrix of the evidence overlap, which linked the systematic reviews with the primary studies, demonstrated a moderate overlap of primary studies with an 8.33% degree of CCA. This overlap is graphically displayed using the GROOVE tool in Figure 5. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (9.62%). Since only repeated studies across reviews contribute to the degree of measured overlap, the inclusion of one unique primary study in one systematic review [95] slightly reduces the overall calculated overlap. The highest degree of overlap of primary studies (CCA 37.5%) can be seen across two reviews categorised as theory-based oral health education interventions [96,97]. This is a qualitatively different finding to the overall figure which conceals this structured hotspot.

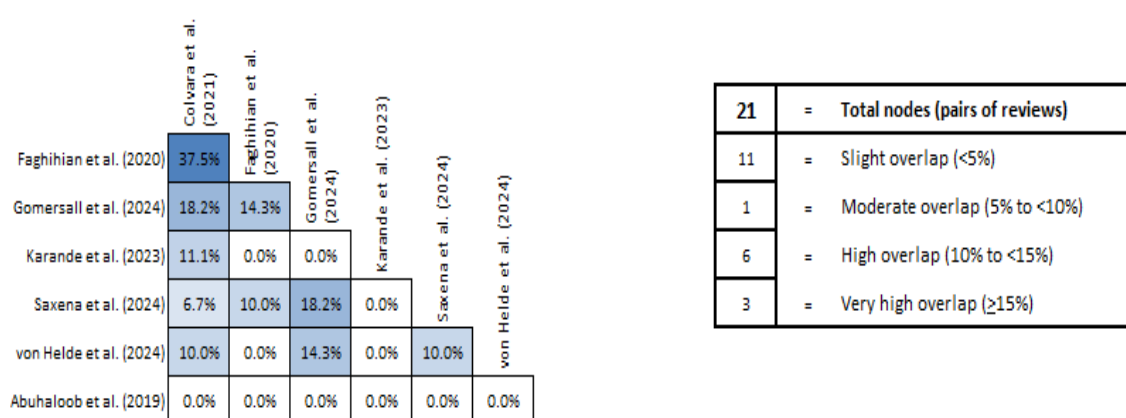


Figure 5: Graphical representation of overlapping primary studies of early childhood dental caries

3.3.5 Summarised results of identified systematic reviews

We identified seven systematic reviews that reported the effects of oral health promotion for pregnant women, mothers, and caregivers on the prevention of early childhood dental caries. The effectiveness of these interventions was measured using different measures and scales to assess increments and levels of dental caries presence.

3.3.5.1 Simple oral health education

Four reviews that we categorised as simple oral health education reported on the effectiveness of oral health education with information and knowledge sharing compared with standard care or no intervention.

Saxena *et al.* reported on the presence of early childhood caries assessed when children were aged 2–6 years following oral health education delivered to the mothers either pre- or post-natal [100]. Pooled data from eight primary studies, indicating low-certainty evidence, found that children in the control groups had a higher risk of developing early childhood caries than those in the intervention groups.

Abuhaloob *et al.* evaluated the effectiveness of verbal instruction and reminders of child oral health promotion, which were incorporated into ongoing government vaccination programmes and delivered by vaccination staff [95]. The findings from a single primary study indicated very low-certainty evidence of a significant reduction in early childhood dental caries measured using decayed enamel and decayed teeth increments at 6 months follow-up.

von Helde *et al.* provided a narrative synthesis of two primary studies indicating low-certainty evidence for oral health promotion using various educational tools for pregnant women [101]. Their findings suggested that interventions can be effective in preventing dental caries in babies, with the greatest effect seen in babies whose mothers had face-to-face contact with health agents.

The final review in this group, from Gomersall *et al.*, compared four different oral health education/promotion interventions against standard care as part of a Cochrane review, indicating moderate-certainty evidence [98]. The first comparison evaluated a combined oral hygiene, diet and feeding practice advice intervention. Pooled data from five primary studies measuring dental caries presence, and pooled data from two primary studies measuring dmfs scores, suggest little to no difference in risk of dental caries presence and mean dmfs scores in primary teeth among children aged 1–6 years. The second comparison evaluated diet and feeding practice advice alone. Pooled data from three primary studies measuring dental caries presence, and pooled data from two primary studies measuring dmfs scores, suggest a slightly reduced risk of dental caries and a possible slight reduction in mean dmfs scores. A third comparison evaluated the effects of breastfeeding promotion. Pooled data from two primary studies measuring dental caries presence, and pooled data from two primary studies measuring dmft scores, found little to no difference in the risk of dental caries and mean dmft scores. Finally, diet advice alone was evaluated in a single primary study, which was automatically downgraded to very low-certainty evidence; the authors found uncertain evidence on the risk of dental caries presence in primary teeth in children aged 3 years [98].

In addition to evaluating early childhood caries, Abuhaloob *et al.* also examined the effect of oral health education on oral health behaviours of mothers when attending to the cleaning of their children's teeth [95]. Abuhaloob *et al.* reported findings from a single primary study, which was automatically downgraded to very low-certainty evidence, and found a significant improvement in mothers cleaning their children's teeth when oral health interventions are incorporated into ongoing childcare.

Only one review [101] reported on the periodontal parameters of the mothers. In a narrative synthesis of two primary studies utilising similar approaches for oral health promotion (didactic material, digital material, and verbal guidance), indicating low-certainty evidence, von Helde *et al.* reported that mothers showed a reduction in biofilm, dental caries, and periodontitis after the interventions.

3.3.5.2 Theory-based oral health education

Three reviews that we categorised as theory-based oral health education reported on the effectiveness of MI-based behavioural counselling interventions, with or without training and skills acquisition, provided for pregnant women and mothers, irrespective of their children’s age, compared with any traditional oral health education or no intervention.

Colvara *et al.* [96] reported their findings on increments of dmft/dmfs in order to measure dental caries level at up to 3 years follow-up. The findings from eight pooled primary studies, indicating low-certainty evidence, contributed to the analysis that reported a reduction in dental caries level compared with baseline, with the greatest benefits seen for those children who had more dental caries at baseline.

Faghihian *et al.* reported clinical rates of early childhood caries measured at 24 months follow-up [97]. Pooled data from three primary studies, indicating low-certainty evidence, found that MI is as effective as traditional dental health education (i.e. there was no significant difference between the groups). In a narrative synthesis of eight primary studies, which reported various parameters for measuring the presence of dental caries, Faghihian *et al.* concluded that in most of the studies, MI was more effective than traditional education in controlling dental caries. However, the certainty of evidence was assessed as being very low [97].

Karande *et al.* reported the presence of dental caries using the ICDAS at up to 3 years follow-up [99]. Pooled data from two primary studies, indicating moderate-certainty evidence, found a significant difference in favour of the MI group, with the incidence of dental caries being lower in children whose mothers received the MI approach compared with traditional oral health education.

Table 12 presents a high-level summary of intervention categories and outcomes of oral health promotion interventions for maternal and early childhood.

Table 12: Main review outcomes for maternal and early childhood caries prevention

Review	Intervention category	Outcome	GRADE certainty of evidence†
Abuhaloob <i>et al.</i> (2019)	Simple OHE versus information only/no intervention	Significant reduction in increments of decayed enamel/teeth	Very low (automatically downgraded)
Colvara <i>et al.</i> (2021)	OHE + theory-based interventions versus any or no intervention	Reduction in dental caries level (dmft/dmfs)	Low
Faghihian <i>et al.</i> (2020)	OHE + theory-based interventions (MI) versus traditional dental health education	No difference in rates of carious, missing, or restored tooth surfaces	Low
		Reduced presence of early childhood caries	Very low
Gomersall <i>et al.</i> (2024)	Simple OHE (combined oral hygiene, diet and feeding practice advice) versus standard care	Little to no difference in dental caries presence in primary teeth or mean dmfs scores	Moderate
	Simple OHE (diet and feeding practice advice) versus standard care	Slightly reduced risk of dental caries presence in primary teeth and possible reduction in mean dmfs scores	Moderate

Review	Intervention category	Outcome	GRADE certainty of evidence†
	Simple OHE (breastfeeding promotion) versus standard care	Little to no difference in dental caries presence in primary teeth or mean dmft scores	Moderate
	Simple OHE (diet advice) versus standard care	Uncertain evidence on risk of dental caries presence in primary teeth	Very low (automatically downgraded)
Karande <i>et al.</i> (2023)	OHE + theory-based interventions (MI) versus traditional dental health education	Significant reduction in incidence of dental caries measured using the ICDAS	Moderate
Saxena <i>et al.</i> (2024)	Simple OHE versus control	Reduced risk of early childhood caries	Low
von Helde <i>et al.</i> (2024)	Simple OHE (any) versus control	May reduce risk of dental caries presence in primary teeth	Low
Overlap of primary studies‡		Moderate overlap	

†GRADE certainty of evidence ratings: High, moderate, low, or very low.

‡Overlap: None (0%), slight (1–5%), moderate (6–10%), high (11–15%), or very high (≥15%).

3.4 What is the effectiveness of health promotion programmes (broad) targeted at children and adolescents

Table 13: Included systematic reviews children and adolescents

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
Atif <i>et al.</i> (2024)	Effectiveness of various methods of educating children and adolescents for the maintenance of oral health: A systematic review of randomized controlled trials	10	India; Iran; Greece; Jordan; Syria; Turkey	Various education methods covering both information-transfer and demonstration components	OHE + training
Dadipoor <i>et al.</i> (2023)	Educational intervention of improve student's oral health: a systematic review and meta-analysis school-based	12	India; Iran; Pakistan; Taiwan; Uzbekistan	Broad educational mechanisms	OHE + training
Gurav <i>et al.</i> (2022)	Effectiveness of oral health educational methods among school children aged 5-16 years in improving their oral health status: a meta-analysis	9	Greece; India; Syria	Information provision	Simple OHE

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
He et al. (2024)	Effectiveness of psychological intervention in improving adolescents' oral health: A systematic review and meta-analysis	13	Hong Kong; Iran; Lithuania; Sweden	Psychological interventions based on behaviour change theories	OHE + theory-based
Kim and Kim (2024)	Effectiveness of school-based oral health education for children and adolescents in low- and middle-income countries: a systematic review and meta-analysis	20	Brazil; China; India; Iran; Pakistan; Tanzania; Thailand; Zimbabwe	Information and practical demonstrations	OHE + training
Nazari et al. (2025)	Health promotion theory-based educational interventions for improving oral health in children and adolescents: a systematic review and meta-analysis	19	Hong Kong; Iran; Lithuania; Pakistan; Thailand	Behaviour change theory-based health promotion	OHE + theory-based
Priya et al. (2019)	Effectiveness of school dental health education on the oral health status and knowledge of children: A systematic review	11	Belgium; China; England; Finland; Greece; India; Iran; Pakistan; Taiwan; UK; USA	Mixed delivery of oral health education spanning information and skills	OHE + skills
Shakir et al. (2021)	Effectiveness of school-based behavioural interventions to improve children's oral health by reducing sugar intake and promoting oral hygiene: A rapid review of randomised controlled trials	8	Finland; Germany; India; Iran; Pakistan; Taiwan	Explicitly behavioural information including supervised skill acquisition	OHE + skills
Stein et al. (2018)	Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis	12	Brazil; England; Finland; India; Iran; Jordan; Pakistan; Yugoslavia	Professional-led oral health education, guidance and skill instruction	OHE + combined
Tsai et al. (2020)	Health promotion interventions to improve oral health of adolescents: A systematic review and meta-analysis	24	Brazil; England; Finland; India; Iran; Lithuania; Pakistan; Romania; Sweden; Tanzania; USA; Uzbekistan; Yugoslavia	Broad community oral health education encompassing information, demonstration, supervised skill acquisition	OHE + combined
Xiang et al. (2020)	The effectiveness of behavioral interventions to improve oral health in adolescents at different	17	Brazil; China; England; Finland; India; Iran; Lithuania;	Behavioural interventions	OHE + skills

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
Xiang <i>et al.</i> (2021)	periods of follow-up: A systematic review and meta-analysis	10	Pakistan; Sri Lanka; USA; Yugoslavia	with practice components	OHE + theory-based
	The application of theory-guided oral health interventions in adolescents: a systematic review and meta-analysis of randomized controlled trials		Iran; Lithuania; Pakistan; Thailand	Behaviour change theory-guided interventions	

3.4.1 Review characteristics

Twelve systematic reviews [102–113] reported on oral health promotion and education interventions delivered to schoolchildren and adolescents, and reported on the effect that these interventions had on their oral health status (plaque scores, gingival health, and cavitated caries), oral-health-related behaviours (brushing, flossing, and diet), and/or oral-health-related quality of life. The reviews were conducted in Australia [111], Brazil [110], Denmark [102], Hong Kong [105,112,113], India [104,108], Iran [103,107], Republic of Korea [106], and the United Kingdom [109]. Not all of the included systematic reviews reported the total number of participants, and as we only included primary studies with relevant outcomes of interest, we determined the total number of participants based on the number reported in each included primary study. Across the 12 systematic reviews, we calculated that the total number of included participants ranged from 1,100 (9 primary studies) to 14,698 (11 primary studies). In one systematic review, we could not calculate the total number of participants included, as it was unclear which primary studies the review authors included in their synthesis.

Most interventions reported were school-based. The school setting was clearly specified in six systematic reviews, the school or clinic setting was specified in two reviews, and the setting was not discernible or not reported in the remaining four reviews. Seven reviews specified the age range of the participants included in the review, encompassing children and adolescents aged 3–18 years, children aged up to 12 years, and adolescents with an approximate age range of 10–19 years. None of the reviews specified the participants' gender. When gender was reported, reviews included any gender or reported that both sexes were included. The total numbers of included primary study designs (not accounting for overlap) were: 77 RCTs, 72 cluster RCTs, and 14 NRTs. The time frame for follow-up across the trials ranged from 2 weeks to 10 years (oral health behaviours only extended to 10 years).

One of the included systematic reviews examined interventions categorised as simple oral health education [104], three reviews examined interventions categorised as theory-based oral health education [105,107,112], three reviews examined interventions categorised as oral health education and training [102,103,106], three reviews examined interventions categorised as oral health education and skills acquisition [108,109,113], and two reviews examined interventions categorised as combined oral health education [110,111] (0). All of the systematic reviews considered a wide variety of oral health education and promotion tools and modalities. In addition to those utilised for maternal and early childhood interventions (lectures, pamphlets, videos, and one-to-one, group, or face-to-face sessions providing verbal information, with or without reinforcement or reminders), combinations of school-based games, flashcards, and puzzles; multimedia and audiovisual aids; role-play; practical demonstrations; hands-on practice sessions; interactive learning activities and group-based discussions; peer-led or family/parental involvement; and smartphone-based interventions/e-learning comprised many of the complex

interventions described. Each of the three systematic reviews categorised as theory-based oral health education included a wide range of psychological behaviour change theories and models (such as the Health Belief Model, Theory of Planned Behaviour, Social Cognitive Theory, and the Health Action Process Approach) in addition to the various educational tools.

When we examined who provided the interventions, we found two systematic reviews that limited inclusion to studies where dental professionals delivered oral health education. All other reviews included a variety of oral health and non-oral health professionals (dentists, dental practitioners, dental hygienists, dental assistants, dental nurses, dental facilitators, and health education specialists), school personnel (teachers, kindergarten staff, and school health coaches), peers, parents, community organisations, and researchers/investigators providing or delivering the interventions alone or in partnership, or included primary studies that did not report who provided or delivered the intervention(s).

3.4.2 Quality assessment

As outlined in Section 2.6.2 and further described in Section 3.3.2, we assigned the seven critical domains in the adapted AMSTAR 2 quality assessment tool recommended by Shea *et al.* [86]. Of the 12 included systematic reviews in this population group, only 1 was judged as having a high overall quality rating [102], indicating that it had no critical flaws; 1 systematic review was judged as having a low overall quality rating [105], indicating that it had one critical flaw; and the remaining 10 reviews were judged as being of critically low quality, indicating that they had more than one critical flaw (Appendix E).

The critical flaws identified for the critically low-quality reviews varied, with the most common critical flaws being that the review authors did not establish a protocol prior to conducting the review, did not provide a list of excluded studies and their reasons for exclusion, did not take RoB into account when interpreting the findings, and did not carry out an adequate investigation of publication bias and discuss its likely impact on the results of the review. While appropriate methods for the statistical combination of results from primary studies were largely utilised, limited information was provided on how review authors accounted for combining RCTs and cluster RCTs in the meta-analyses. Three of the reviews completed a narrative synthesis only.

3.4.3 Certainty of evidence

The certainty of evidence as assessed using the modified GRADE criteria [90] was determined for each extracted outcome of interest, and the number of downgrades applied and reasons for downgrading are presented in Appendix G. There were no outcomes reported in the reviews without any downgrades, and therefore there were none with a high certainty of evidence. Again, it is important to note that outcomes within the same review could be graded at different levels of certainty as a result of comparing various interventions, levels of intervention, or different outcome measures in the meta-analyses, or where the review authors presented data from a single study or an additional narrative synthesis (see Table 14).

In outcomes pertaining to oral health status, seven reviews reported on various clinical indices (plaque scores, gingival scores, oral hygiene, gingival bleeding, and Simplified Debris index (DI-S)) in order to evaluate the effectiveness of oral health promotion. Only one review [102] presented moderate-certainty evidence, as assessed using the modified GRADE algorithm. The reasons for downgrading to moderate-certainty evidence were inadequate randomisation, inadequate blinding of outcome ascertainment, and inconsistency (high heterogeneity). In this review, oral health status data were presented as a narrative synthesis. Seven reviews [102,104–106,109,110,113] presented low-certainty evidence. The reasons for downgrading to a low certainty of evidence included study design, inadequate randomisation, inadequate blinding of outcome ascertainment, inconsistency (high heterogeneity), and quality rating on the adapted AMSTAR 2 instrument. Two studies provided meta-analyses of findings, two studies provided narrative

syntheses, and three studies provided both. Five reviews [102,104,109,110,113] presented very low-certainty evidence. The reasons for downgrading to very low-certainty evidence included study design, inadequate randomisation, inadequate blinding of outcome ascertainment, inconsistency (high heterogeneity), and quality rating on the adapted AMSTAR 2 instrument. Two reviews presented outcomes from single primary studies, and were automatically downgraded to very low-certainty evidence. Three reviews presented narrative syntheses only, while two reviews presented narrative syntheses in addition to meta-analyses.

In outcomes pertaining to oral-health-related behaviours, three reviews reported on various outcomes of interest. Only one review [108] presented low-certainty evidence relating to unspecified oral health behaviours and dietary habits. The reasons for downgrading to low-certainty evidence included study design, inconsistency (high heterogeneity), and quality rating on the adapted AMSTAR 2 instrument. Findings were presented in a narrative synthesis. All three reviews [108,109,113] presented very low-certainty evidence for toothbrushing/flossing, frequency/amount of self-reported sugar intake, and unspecified oral health behaviours, respectively. All were narrative syntheses, and the reasons for downgrading to very low-certainty evidence were study design, inadequate randomisation, inadequate blinding of outcome ascertainment, inconsistency (high heterogeneity), and quality rating on the adapted AMSTAR 2 instrument.

One included systematic review [111] completed a quality appraisal of the included primary studies but did not report a risk of bias assessment. We therefore were unable to complete a GRADE assessment on this review without formal risk of bias assessment applied. Three reviews [103,107,112] presented major challenges (i.e. meta-analysis included studies that the review authors had not provided summaries of or sample sizes for) and concerns regarding the included meta-analyses (i.e. double-counting of participants, multiple time points included in a single meta-analysis) due to which we considered it inappropriate to grade the certainty of evidence, as we could not incorporate the data into our synthesis.

Table 14: Children and adolescents GRADE assessment

Author (year)	Intervention category	Outcome measure	GRADE rating†	Synthesis
Oral health status and behaviours				
Atif et al. (2024)	OHE + training (leaflets/flashcards/books)	Oral hygiene (plaque and gingival scores)	Moderate	Narrative
	OHE + training (audiovisual aids)	Plaque index (PI)	Very low (automatically downgraded)	Single study
	OHE + training (smartphone apps)	Oral hygiene (plaque and gingival scores)	Moderate	Narrative
	OHE + training (lectures)	Oral hygiene (unspecified measure)	Low	Narrative
Gurav et al. (2022)	Simple OHE	PI	Low	MA
		Gingival index (GI)	Low	MA
		Simplified Oral Hygiene Index (OHI-S)	Low	MA
		DI-S	Low	MA
		Decayed, missing, and/or filled permanent teeth (DMFT)	Very low	MA

Author (year)	Intervention category	Outcome measure	GRADE rating†	Synthesis
Oral health status and behaviours				
He <i>et al.</i> (2024)	OHE + theory-based	Plaque index (various)	Low	MA
		Community Periodontal Index (CPI)	Low	MA
		Dental caries	Low	Narrative
Priya <i>et al.</i> (2019)	OHE + skills acquisition	Toothbrushing	Very low	Narrative
		Oral hygiene behaviours	Low	Narrative
		Dietary habits	Low	Narrative
Shakir <i>et al.</i> (2021)	OHE + skills acquisition	Dental caries	Very low	Narrative
		Sugar intake	Very low	Narrative
		Plaque/gingival scores (unspecified measures)	Low	Narrative
Stein <i>et al.</i> (2018)	OHE + combined (all dental professionals)	PI	Low	MA
		GI	Low	MA
		DMFT, decayed, missing, and filled permanent surfaces (DMFS), dmfs	Very low	Narrative
		CPI	Very low (automatically downgraded)	Single study
		Mineralisation of molars	Very low (automatically downgraded)	Single study
		Plaque index	Low	MA
		Plaque/gingival scores	Low	Narrative
Xiang <i>et al.</i> (2020)	OHE + skills acquisition	GI (3 months)	Low	MA
		GI (6 months)	Very low	MA
		PI (3 months)	Low	MA
		PI (6 months)	Low	MA
		PI (12 months)	Low	MA
		Oral health behaviour	Very low	Narrative

†GRADE certainty of evidence ratings: High, moderate, low, or very low.

3.4.4 Overlap

As outlined in Section 2.2, we addressed the issue of overlapping primary studies evaluating the same outcome of interest across the included systematic reviews by using the GROOVE tool in order to automatically calculate the CCA of overlap and then graphically display this finding in an easy-to-read

figure [47]. We integrated the overlap of the included primary studies in the high-level summaries of evidence for each outcome of interest reported in Section 3.4.5.

Of the included systematic reviews that reported on oral health status, three discrete outcome measures were employed: plaque scores, gingival health scores, and cavitated caries. We assessed and reported on these outcomes separately. Across 8 reviews, 34 primary studies reported plaque scores as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a moderate overlap of primary studies, with a 7.56% degree of CCA. This overlap is graphically displayed using the GROOVE tool in Figure 6. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (8.45%, moderate overlap). We also removed the Xiang *et al.* 2021 review from our calculation, as this review was not included in our synthesis, resulting in a 7.91% degree of adjusted CCA (moderate overlap).

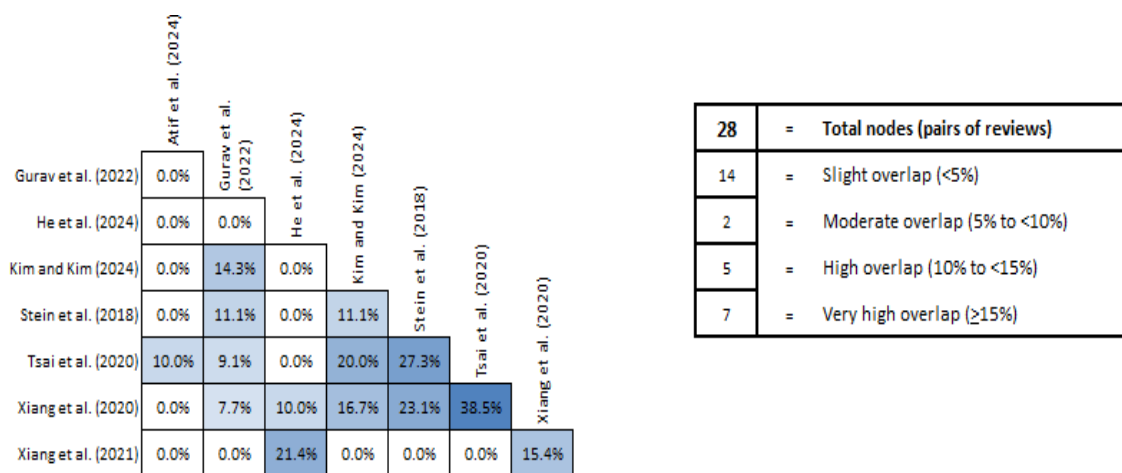


Figure 6: Graphical representation of overlapping primary studies of plaque scores in children and adolescents

Across 7 reviews, 21 primary studies reported gingival health scores as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a moderate overlap of primary studies, with an 8.73% degree of CCA. This overlap is graphically displayed using the GROOVE tool in Figure 7. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (9.02%).

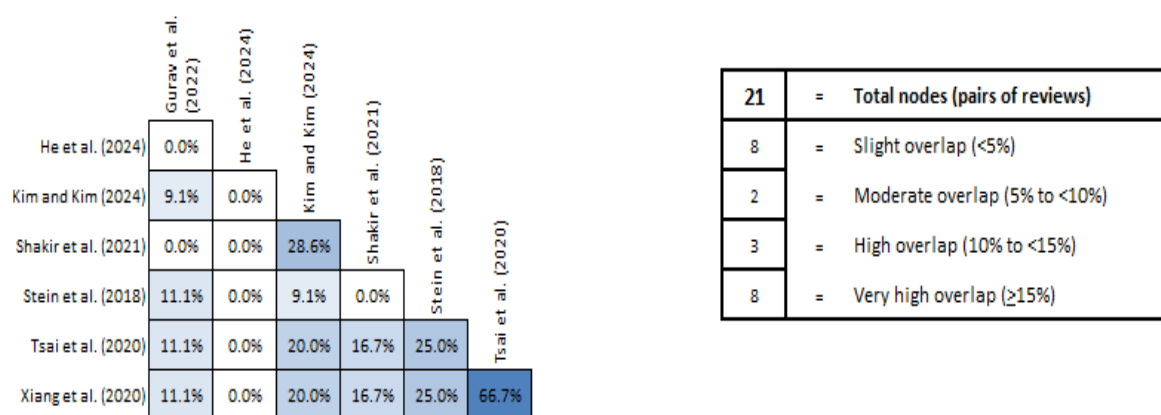


Figure 7: Graphical representation of overlapping primary studies of gingival health scores in children and adolescents

Across 5 reviews, 14 primary studies reported on cavitated caries as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a slight overlap of primary studies, with a 3.57% degree of CCA. This overlap is graphically displayed using the GROOVE tool in Figure 8. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (3.92%).

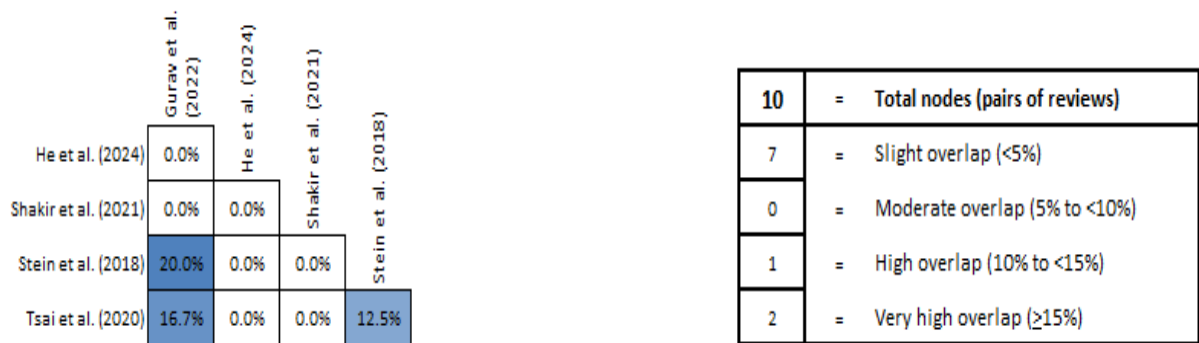


Figure 8: Graphical representation of overlapping primary studies of cavitated caries in children and adolescents

Across 4 included systematic reviews, 22 primary studies reported various oral-health-related behaviours. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a moderate overlap of primary studies, with a 9.09% degree of CCA. This overlap is graphically displayed using the GROOVE tool in Figure 9. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (10.91%).

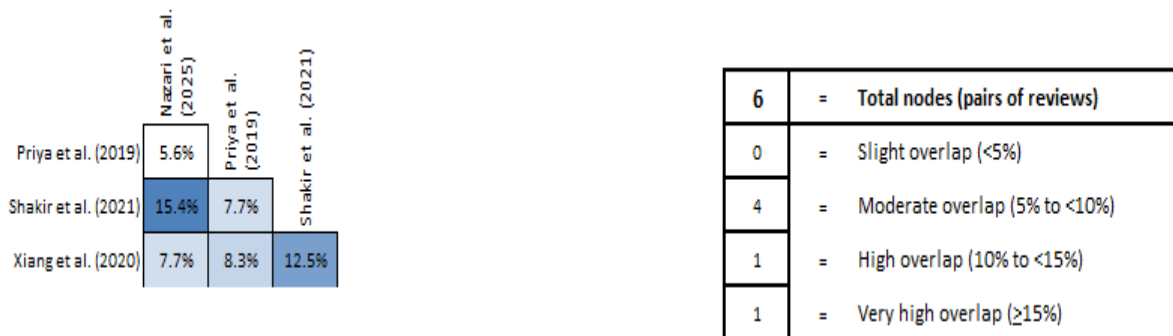


Figure 9: Graphical representation of overlapping primary studies of oral-health-related behaviours in children and adolescents

3.4.5 Summarised results of identified systematic reviews

We identified 12 systematic reviews that reported the effects of oral health promotion for children and adolescents on oral health status and oral-health-related behaviours. Only one review reported measures of oral-health-related quality of life; however, due to multiple time points pooled in the meta-analysis creating a unit-of-analysis error, we were unable to use the data from that review in our current overview.

3.4.5.1 Simple oral health education

One systematic review [104] that we categorised as simple oral health education reported on the effectiveness of oral health education with information and knowledge sharing, provided by dental professionals, compared with traditional oral health education for children and adolescents aged 5–16 years. Outcomes assessed – indicating low-certainty evidence – were related to oral health status, with plaque scores (PI), OHI-S, DI-S, gingival health (GI), and dental caries (DMFT) being measured. Pooled data from four primary studies found no significant difference in mean PI scores in the intervention group versus the control group. Two of these studies also examined gingival health separately. Pooled data found no statistically significant difference in mean GI scores, suggestive of no statistically significant difference in the effect of the intervention on gingival health compared with the control. However, opposing results were noted in this meta-analysis, as results from one primary study favoured the intervention and results from the other primary study favoured the control group. Pooled data from two primary studies found statistically significantly lower OHI-S scores in the intervention group, with a cumulative mean difference (MD) of -0.37 (95% confidence interval (CI): $-0.74, 0.00$) favouring the dental professionals' intervention over traditional methods. Similarly, pooled data from another two primary studies, measuring DI-S scores, showed statistically significant improvements in oral hygiene status in the intervention group. Just two primary studies assessed dental caries using DMFT scores. Pooled data from one RCT and one NRT prospective cohort trial, indicating very low-certainty evidence, showed a reduction in favour of the intervention but no statistically significant difference from baseline to post-intervention. Across all included interventions, the time frame for follow-up ranged from 1 month to 18 months.

3.4.5.2 Theory-based oral health education

Three systematic reviews examined interventions that we categorised as theory-based oral health education [105,107,112], which aimed to improve the oral health of children and adolescents compared with conventional or no oral health education; however, we could not include pooled data from two of these reviews due to reporting issues (i.e. meta-analysis included studies that the review authors had not provided summaries of or sample sizes for) and methodological concerns (i.e. multiple time points were included in a single meta-analysis). As a result the remaining review is the sole source of pooled evidence in this category and limits confidence in any conclusions drawn.

He *et al.* included psychological interventions based on theoretical models aimed at improving adolescents' (aged 12–18 years) oral health [105]. The reviewers pooled data in order to analyse oral hygiene status in both the short term (up to 6 months) and longer term (12–24 months), with low-certainty evidence of outcomes. Pooled data from 11 primary studies reported a statistically significant improvement on various plaque indices at up to 6 months follow-up (overall weighted standardised mean difference (SMD) of -0.97 (95% CI: $-1.45, -0.49$; $I^2: 98\%$)). It should be noted that this review demonstrated a low overall quality rating and the individual pooled studies are so heterogeneous that the pooled result has very limited interpretive value. Pooled analysis from eight primary studies showed no sustained effect at 12–24 months follow-up. Pooled data from three primary studies that examined oral health status, measured using CPI, at up to 6 months follow-up reported statistically significantly better periodontal status in the intervention group (overall weighted SMD of -1.18 (95% CI: $-2.32, -0.04$; $I^2: 99\%$)). In a narrative synthesis of two primary studies, He *et al.* reported that the increment of cavitated lesions was lower in the intervention group compared with the control group at 12 months follow-up (a positive result) [105]. Only one study found the same result at 24 months follow-up. It is important to note that the psychological theory/model used as the intervention varied between primary studies.

3.4.5.3 Oral health education and training

Three systematic reviews examined school-based interventions that we categorised as oral health education and training [102,103,106], which included various demonstrations, instruction, activities, and

action planning compared with conventional or no oral health education. Due to methodological concerns (i.e. double-counting of participants) in the meta-analyses presented in the Dadipoor *et al.* systematic review, we could not include the pooled data in our synthesis [103].

Atif *et al.* examined the effectiveness of various modalities of oral health education and training, which they broadly categorised and compared in a narrative synthesis across 10 primary studies, indicating moderate- to very low-certainty evidence across the reported outcomes [102]. However, as this review conducted narrative syntheses only, high heterogeneity of primary studies was assumed, and therefore the moderate-certainty evidence carries less precision than were the findings of a meta-analysis. Review authors reported their reason for not conducting a meta-analysis was due to variability in the interventions, study periods, and outcome variables. Four primary studies comparing leaflets/flash cards/books versus other interventions/controls reported positive reductions in plaque and gingival scores. Statistically significant improvements in oral cleanliness and gingival health, measured by reductions in mean dental plaque/gingival bleeding indices, were reported in two primary studies. In addition, another two primary studies demonstrated a statistically significant improvement in DI-S scores at 3 months follow-up. Two primary studies comparing smartphone-based/e-learning versus other interventions/controls reported a statistically significant improvement in plaque scores and gingival index scores for the smartphone-based/e-learning group. One of these studies also found improvements in dietary practice scores in the intervention group. Three primary studies comparing different lecturing approaches from a dentist versus conventional teaching/teacher lecture versus other educational methods (drama or playful learning in the classroom) reported a significant improvement in oral hygiene based on DI-S scores across all approaches compared with no intervention. One of the primary studies using playful learning in classrooms as the intervention reported a statistically significant improvement in oral hygiene, as measured using plaque scores. Another primary study, comparing oral health education with and without audiovisual aids versus no intervention, reported improvements in mean plaque scores observed across all intervention groups compared with no intervention [102].

Kim and Kim examined the effectiveness of school-based oral health education programmes (incorporating practical demonstrations and hands-on sessions) in low- and middle-income countries compared with no intervention or a single education session, across 20 primary studies, indicating low-certainty evidence on oral health status outcomes [106]. Pooled data from four primary studies (two RCTs and two NRTs) reported a statistically significant reduction in mean PI and GI scores; however, a lack of detail on the characteristics of trial participants/groups included in the meta-analysis and the high heterogeneity (I^2 : 96%) across the studies indicates some concerns about the similarity of the data being pooled. Pooled data from three primary studies (all RCTs and delivering direct instruction to schoolchildren over a 2–4-month period), estimating gingival health as a dichotomous variable (as an odds ratio (OR)), reported significantly improved gingival health in the intervention group (OR: 0.56; 95% CI: 0.40, 0.77). DMFS was also analysed, and Kim and Kim reported that the intervention was not statistically significant in changing DMFS scores (SMD: -0.003 ; 95% CI: $-0.19, 0.19$); however, the review authors included two unspecified primary studies with no information on the number of participants they included [106].

3.4.5.4 Oral health education and skills acquisition

Three reviews examined interventions that we categorised as oral health education and skills acquisition [108,109,113], which included various hands-on practice sessions and techniques (with or without monitoring and feedback) compared with standard/conventional education or no intervention.

Priya *et al.* examined changes in the oral health practice behaviour of children in a narrative synthesis of 11 school-based primary studies (5 RCTs and 6 NRTs) of oral health education interventions that were

provided by dental professionals or teachers or that were peer-led, indicating low- to very low-certainty evidence across the reported outcomes [108]. The outcomes analysed across six primary studies reported that behaviours such as frequency and duration of toothbrushing improved. One primary study reported that oral health behaviours acquired through experiential learning (compared with traditional learning) were improved at 6 months follow-up, but this behaviour was not maintained at 18 months follow-up, while another study reported that behaviours improved across all groups, with the peer-led group showing the greatest change in the mean oral health behaviours score. Three primary studies that examined dietary habits found that children in the oral health education intervention groups reported eating fewer sweets, reduced sugar intake, and a lower frequency of between-meal snacks, compared with control group.

Shakir *et al.* examined school-based interventions that targeted child oral health behaviours related to both sugar intake and oral hygiene in a narrative synthesis of eight primary studies, indicating low- to very low-certainty evidence across the reported outcomes [109]. The review authors reported inconsistent findings across three studies reporting on dental caries increment. One study reported a significant reduction in the intervention groups, another presented contrary results showing significantly more demineralisation in the intervention groups (albeit all studies were poor quality), and a third reported no significant difference between the intervention and control groups. Two studies reported significant reductions in plaque scores and improvements in gingival health with interventions incorporating peer/parent involvement compared with those delivered by dentists/teachers or without parents' involvement. Five primary studies examined the frequency and amount of sugar intake (measured by self-reported measures or by collecting food wrappers). Synthesised findings reported a significant reduction in self-reported sugar intake in the intervention groups compared with the control groups, with the greatest reduction seen in interventions delivered by peers. Self-reported oral health behaviours were examined across six primary studies, five of which reported a significant improvement in oral hygiene practices, while one reported a reduction in the frequency of toothbrushing in the intervention group with no explanation provided.

Xiang *et al.* (2020) examined oral health behavioural interventions compared with no intervention in adolescents aged 10–19 years, indicating low- to very low-certainty evidence across the reported outcomes [113]. Outcomes that were related to oral health status were meta-analysed at different follow-up time periods using PI and GI scores, while oral health behaviours were narratively synthesised. Pooled data from three primary studies reported no statistically significant differences in GI scores at 3 months follow-up, while pooled data from five primary studies reported a significant decrease (SMD: -0.90 ; 95% CI: $-1.33, -0.47$) in GI scores after 6 months. Pooled data from five primary studies reported a significant reduction (SMD: -0.46 ; 95% CI: $-0.82, -0.10$) in plaque accumulation at 3 months follow-up. In addition, one study reported a significant decrease in OHI-S and CPI scores at this same time point (lower is better; no effect estimate reported). At 6 months follow-up, pooled data from eight primary studies reported a significant decrease in PI scores (SMD: -0.71 ; 95% CI: $-1.08, -0.33$), which was maintained (albeit non-significant) at 12 months follow-up in three studies that included the reinforcement of messages. In a narrative synthesis of six primary studies, immediate improvements were observed in oral health behaviours of increased frequency in toothbrushing and decreased smoking habits (which were most evident in girls), with positive changes reported at up to 9 months follow-up, but it was unclear if these were statistically significant.

3.4.5.5 Combined oral health education

Finally, two reviews examined interventions that we categorised as combined oral health education [110,111], which included training and skills acquisition compared with conventional oral health

education or no intervention. Stein *et al.* reported on the effectiveness of school-based interventions carried out by dental professionals related to oral health status, indicating low- to very low-certainty evidence across the reported outcomes of plaque scores, gingival health, and increments of cavitated caries [110]. Pooled data from five primary studies examining any combined oral health education programme and pooled data from three primary studies examining specific oral health education combined with oral health instruction and demonstration reported a statistically significant reduction in plaque scores (MD: -0.36 (95% CI: -0.59, -0.13; I²: 0%) and MD: -0.42 (95% CI: -0.69, -0.15; I²: 26%), respectively) at up to 6 months follow-up. Pooled data from two primary studies examining any combined oral health education reported no effect on gingival status at up to 9 months follow-up. Narrative synthesis of primary studies examining dental caries reported mixed results of effectiveness, with two studies reporting no significant changes in DMFT or dmft outcomes between intervention and control groups, while another study reported caries status to be improved in the children in the intervention group following supervised daily toothbrushing with fluoride toothpaste (no effect estimates reported) [110].

Tsai *et al.* reported the effectiveness of community oral health interventions related to oral health status, across the reported outcomes of plaque scores, gingival health, and increments of cavitated caries [111]. Pooled data from eight primary studies examining different oral health education interventions, ranging from single-session interventions to community-wide programmes, reported statistically significant reductions in plaque scores. Seven studies reported a statistically significant reduction in PI scores (MD: -0.43; 95% CI: -0.66, -0.2; I²: 99%) in the intervention group following comprehensive oral health education compared with the control group. Four studies reported a statistically significant reduction in PI scores (MD: -0.24; 95% CI: -0.41, -0.07) in the simple oral health education intervention group compared with the control group. Similar positive results were reported across five primary studies for statistically significant improvements in gingival scores between intervention and control groups. Four studies reported a statistically significant reduction in GI scores (MD: -0.45; 95% CI: -0.8, -0.1; I²: 98%) in the intervention group following comprehensive oral health education compared with the control group. Four studies reported a statistically significant reduction in GI scores (MD: -0.07; 95% CI: -0.1, -0.05; I²: 55%) in the simple oral health education intervention group compared with the control group. Pooled analysis from five studies reported 1.2 fewer newly decayed tooth surfaces (MD: -1.15; 95% CI: -1.9, -0.4) in the intervention group than in the control group; however, one of the included primary studies combined clinical preventive measures (sealants, prophylaxis, sodium fluoride solution, restorations) with education and is therefore outside the scope of the current overview. The review authors reported that significant results on any outcome appeared to be more frequent in studies with longer duration (≥12 months) [111].

Table 15 presents a high-level summary of intervention categories and outcomes of oral health promotion interventions for children and adolescents.

Table 15: Main review outcomes for children and adolescents

Review	Intervention category	Outcome	GRADE certainty of evidence†
Plaque levels			
Gurav <i>et al.</i> (2022)	Simple OHE versus traditional OHE/control on oral hygiene and dental health	No difference in mean PI scores	Low
		Significantly improved oral hygiene scores (OHI-S)	Low

Review	Intervention category	Outcome	GRADE certainty of evidence†
		Significant improvement in oral hygiene (DI-S)	Low
He et al. (2024)	OHE + theory-based interventions versus any or no intervention	Significant improvement in mean plaque index scores (short term)	Low
		No difference in mean plaque index scores (longer term)	Low
Atif et al. (2024)	OHE + training (leaflets/flashcards/books) versus other interventions/controls	Positive reduction in PI scores	Moderate
	OHE + training (smartphone-based/e-learning) versus other interventions/controls	Positive reduction in PI scores	Moderate
	OHE + training (audiovisual aids) versus conventional teaching/controls	Improvement in PI scores across all groups	Very low
Kim and Kim (2024)	OHE + training versus usual care	Significant reduction in mean PI scores	Low
Stein et al. (2018)	Dental professional provided OHE + combined (any) versus usual care	Significant reduction in plaque index scores	Low
Tsai et al. (2020)	OHE + combined versus non-exposed control	Significant reduction in PI scores	Not assessed
Xiang et al. (2020)	OHE + skills acquisition versus no intervention/control	Significant reduction in PI scores (3 months)	Low
		Significant reduction in PI scores (6 months)	Low
		Non-significant reduction in PI scores (12 months)	Low
Overlap of primary studies‡		Moderate overlap	
Gingival health status			
Gurav et al. (2022)	Simple OHE versus traditional OHE/control on oral hygiene and dental health	No difference in mean GI scores	Low
		Significantly improved oral hygiene scores (OHI-S)	Low
		Significant improvement in oral hygiene (DI-S)	Low
He et al. (2024)	OHE + theory-based interventions versus any or no intervention	Improved CPI	Low

Review	Intervention category	Outcome	GRADE certainty of evidence†
Kim and Kim (2024)	OHE + training versus usual care	Significant reduction in mean GI scores	Low
Shakir et al. (2021)	OHE + skills acquisition versus no intervention/control	Significant improvement in unspecified gingival scores	Low
Xiang et al. (2020)	OHE + skills acquisition versus no intervention/control	No significant difference in GI scores (3 months)	Low
		Significant improvement in GI scores (6 months)	Very low
Stein et al. (2018)	Dental professional provided OHE + combined versus usual care	No difference in gingival index scores	Low
Tsai et al. (2020)	OHE + combined versus non-exposed control	Significantly improved gingival health	Not assessed
Overlap of primary studies‡		Moderate overlap	
Single review data			
Atif et al. (2024)	OHE + training (leaflets/flashcards/books) versus other interventions/controls	Positive reduction in various gingival scores	Moderate
	OHE + training (smartphone-based/e-learning) versus other interventions/controls	Positive reduction in various gingival scores	Moderate
	OHE + training (lectures from dentist) versus other interventions/controls	Significant improvement in oral hygiene	Low
Overlap of primary studies‡		Not assessed	
Dental caries			
Gurav et al. (2022)	Simple OHE versus traditional OHE/control on oral hygiene and dental health	No significant difference in caries (DMFT)	Very low
He et al. (2024)	OHE + theory-based interventions versus any or no intervention	Fewer cavitated caries (DMFT)	Low
Shakir et al. (2021)	OHE + skills acquisition versus no intervention/control	Positive and negative changes in presence of caries (various measures)	Very low
Stein et al. (2018)	Dental professional provided OHE + combined versus usual care	Mixed effect on cavitated caries (DMFT/DMFS, dmfs)	Very low
Tsai et al. (2020)	OHE +/- training and skills acquisition versus non-exposed control	Possible fewer decayed surfaces	Not assessed
Overlap of primary studies‡		Slight overlap	
Oral health behaviours			

Review	Intervention category	Outcome	GRADE certainty of evidence†
Priya et al. (2019)	OHE + skills acquisition versus no intervention/control	Improved frequency of toothbrushing and flossing (oral hygiene)	Very low
		Improved general oral health behaviours	Low
Shakir et al. (2021)	OHE + skills acquisition versus no intervention/control	Improved dietary habits	Low
		Positive and negative changes in oral hygiene behaviours	Very low
		Reduced frequency/amount of sugar intake (self-report)	Very low
Xiang et al. (2020)		Improved oral health behaviour	Very low
Nazari et al. (2025)	OHE + theory-based interventions versus control	Not included in synthesis	
Overlap of primary studies‡		Moderate overlap	

†GRADE certainty of evidence ratings: High, moderate, low, or very low.

‡Overlap: None (0%), slight (1–5%), moderate (6–10%), high (11–15%), or very high (≥15%).

3.5 What is the effectiveness of health promotion programmes (broad) targeted at older adults

Table 16: Included systematic reviews older adults

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
Albrecht et al. (2016)	Oral health educational interventions for nursing home staff and residents	9	Belgium; Canada; Germany; the Netherlands; Scotland; Switzerland; UK	Information, demonstration and skill instruction used	OHE + combined
Mehta et al. (2025)	Effectiveness of educating caregivers on oral health of institutionalized older adults: a systematic review and meta-analysis	11	Belgium; Canada; China; Finland; Germany; India; the Netherlands; UK; USA	Information, demonstration and caregiver training	OHE + combined
Salazar et al. (2024)	Effect of oral health interventions for dependent older people-A systematic review	17	Belgium; Canada; China; Denmark; Germany; India; the Netherlands; Sweden;	Broad scope of oral health education and training, targeting caregivers,	OHE + combined

Author and year of publication	Title of systematic review	Number of included studies	Countries of primary study origin	Intervention description (SR authors)	Category assigned
			Switzerland; UK; USA	staff, or residents	

3.5.1 Review characteristics

Three systematic reviews [114–116] reported on oral health promotion and education interventions delivered to older adults and/or caregivers, and reported on the effect that these interventions had on their oral health status (plaque scores, gingival health, and cavitated caries), oral-health-related behaviours (brushing, flossing, and diet), and/or oral-health-related quality of life. The reviews were conducted in Germany [114], India [115], and Denmark [116]. Not all of the included systematic reviews reported on the total number of participants, but as we only included primary studies with relevant outcomes of interest, we determined the total number of participants included in each systematic review based on the number reported in each included primary study. We calculated that the total number of participants in the three reviews ranged from 3,253 to 5,559. Two of the systematic reviews included residents of nursing homes or institutional settings [114,115], while the third review [116] also included community-dwelling frail and partially or completely dependent older adults. The mean age of the participants ranged from 64 years to 89 years across the three systematic reviews, and in two of the reviews 40% of the reported participants were women; gender was not reported in the third review). The total numbers of included primary study designs (not accounting for overlap) were 9 RCTs and 28 cluster RCTs. The time frame for follow-up across the trials ranged from 3 months to 5 years.

All of the included systematic reviews examined interventions that we categorised as combined oral health education. All of the systematic reviews considered a wide variety of oral health education and promotion tools and modalities that provided practical training and/or supervised instruction directly to caregivers, directly to residents, or to both. All of the reviews included a variety of oral health and non-oral health professionals (dentists, dental professionals, dental hygienists, oral health specialist nurses, occupational therapists, nursing staff, and nurse educators), health promoters, multi-care providers, mouth care providers, caregivers, and researchers/investigators providing or delivering the interventions alone or in partnership. Only one of the reviews included primary studies that did not report on who provided or delivered the intervention(s).

3.5.2 Quality assessment

As outlined in Section 2.6.2 and further described in Section 3.3.2, we assigned the seven critical domains in the adapted AMSTAR 2 quality assessment tool recommended by Shea *et al.* [86]. Of the three included systematic reviews in this population group, only one was judged as having a high overall quality rating [114], indicating that it had no critical flaws. The other two reviews were judged as having a low overall quality rating [115,116], indicating that they had one critical flaw (Appendix E). The critical flaw identified for the low-quality reviews was that the review authors did not carry out an adequate investigation of publication bias and discuss its likely impact on the results of the review. All three of the reviews completed meta-analyses of the outcomes of interest.

3.5.3 Certainty of evidence

The certainty of evidence, as assessed using the modified GRADE criteria [90], was determined for each extracted outcome of interest, and the number of downgrades applied and reasons for downgrading are presented in Appendix G. There were no reviews that presented outcomes without any downgrades, and

therefore there were no outcomes with a high certainty of evidence. Again, it is important to note that outcomes within the same review could be graded at different levels of certainty as a result of comparing various interventions, levels of intervention, or different measures of outcomes in the meta-analyses, or where the review authors presented data from a single study or an additional narrative synthesis (see Table 17). In outcomes pertaining to oral health status, all three of the reviews reported various clinical indices (plaque scores, gingival scores, denture hygiene index, and presence of cavitated caries) in order to evaluate the effectiveness of oral health promotion, with only one review reporting on oral-health-related quality of life.

Table 17: Older adults GRADE assessment

Author (year)	Intervention category	Outcome measure	GRADE rating [†]	Synthesis
Dental and denture health and hygiene				
Albrecht <i>et al.</i> (2016)	OHE + combined	Dental plaque scores	Moderate	MA
		Denture plaque	Moderate	MA
		Gingival scores	Moderate	Narrative
		Denture stomatitis	Low	Narrative
		Root caries	Low	Narrative
Mehta <i>et al.</i> (2025)	OHE + combined	Dental plaque scores	Moderate	MA
		Denture hygiene index	Low	MA
Salazar <i>et al.</i> (2024)	OHE + combined	Dental plaque scores (short term)	Low	MA
		Dental plaque scores (longer term)	Very low	MA
		Gingival index	Moderate	MA
		Denture plaque scores (short term)	Moderate	MA
		Denture plaque scores (longer term)	Low	MA
		OHE + combined (supervised versus unsupervised)	Gingival bleeding index	Low
Oral-health-related quality of life				
Salazar <i>et al.</i> (2024)	OHE + combined in long-term care facilities	Oral-health-related quality of life	Very low (automatically downgraded)	Single study

[†]GRADE certainty of evidence ratings: High, moderate, low, or very low.

3.5.4 Overlap

As outlined in Section 2.2, we addressed the issue of overlapping primary studies evaluating the same outcome of interest across the included systematic reviews by using the GROOVE tool in order to automatically calculate the CCA of overlap and then graphically display this finding in an easy-to-read figure [47]. We integrated the overlap of the included primary studies in the high-level summaries of evidence for each outcome of interest reported in Section 3.5.5. Of the three included systematic reviews

that reported oral health status, three discrete outcome measures were employed: dental plaque scores, denture plaque scores, and gingival health scores. We assessed and reported on these outcomes separately. As only one review reported on the presence of cavitated caries in a narrative synthesis and only one review reported on oral-health-related quality of life, an overlap assessment was not applicable for those two outcomes.

Across the 3 reviews, 13 primary studies reported dental plaque scores as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a very high overlap of primary studies, with a 34.62% degree of CCA, and this highlights the extent to which the same primary studies are included in the reviews. This overlap is graphically displayed using the GROOVE tool in Figure 10. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (40.91%).

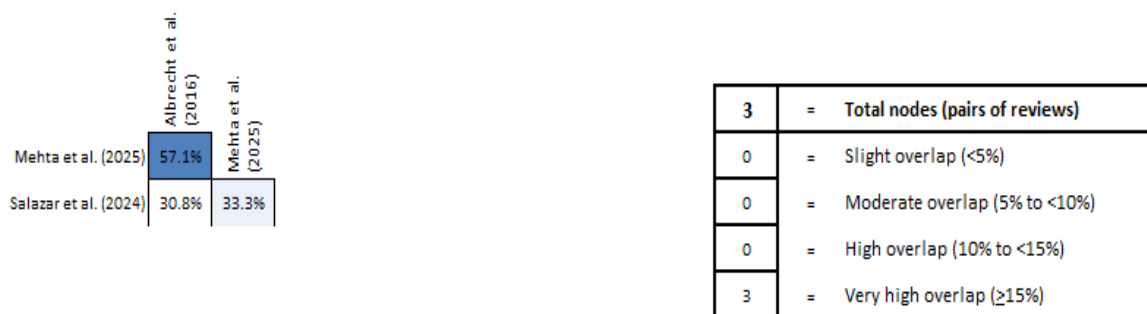


Figure 10: Graphical representation of overlapping primary studies of dental plaque scores in older adults

Across the three reviews, nine primary studies reported denture plaque scores as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated a very high overlap of primary studies, with a 44.44% degree of CCA, and this again highlights the extent to which the same primary studies are included in the reviews. This overlap is graphically displayed using the GROOVE tool in Figure 11. When we adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (50.0%).

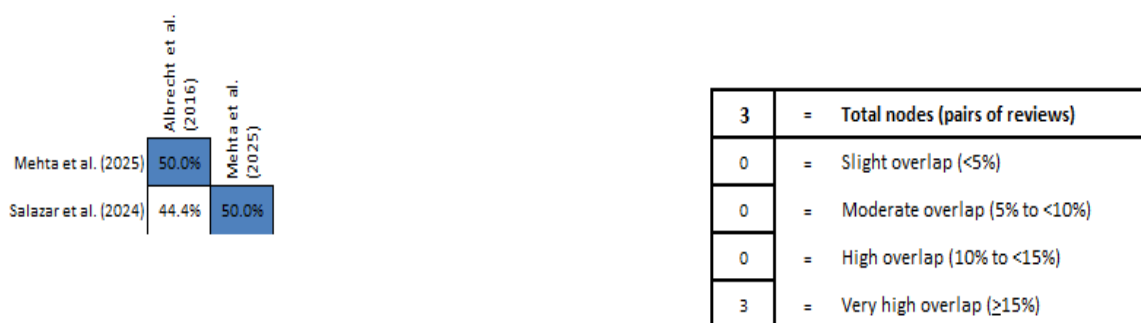


Figure 11: Graphical representation of overlapping primary studies of denture plaque scores in older adults

Only two of the reviews reported outcomes for gingival health. Across the two reviews, seven primary studies reported gingival index scores as a measure of oral health status. A matrix of the evidence overlap linking the systematic reviews with the primary studies demonstrated very high overlap of primary studies, with a 42.86% degree of CCA, and again this highlights the extent to which the same primary studies are reported. This overlap is graphically displayed using the GROOVE tool in Figure 12. When we

adjusted the matrix to account for chronological missingness, where primary studies post-date a systematic review search date, the adjusted CCA is higher (75.0%).

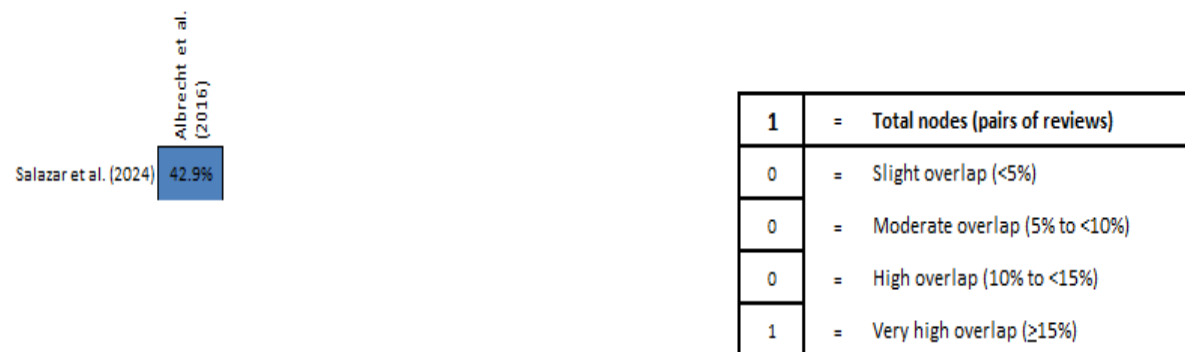


Figure 12: Graphical representation of overlapping primary studies of gingival index scores in older adults

3.5.5 Summarised results of identified systematic reviews

We identified three systematic reviews [114–116] that reported on the effects of oral health promotion for older adults on oral health status and oral-health-related quality of life. All three of the reviews examined interventions delivered to older adults and/or caregivers, and we categorised these interventions as combined oral health education, which included training and skills acquisition compared with usual/routine care or no active oral health intervention.

Albrecht *et al.* reported the effectiveness of interventions for older adults residing in nursing homes or long-term care facilities (that provided supervision or nursing care), and for the nursing staff working in these facilities, that were related to outcomes of oral health status. Interventions were provided by dental health professionals (dentists and dental hygienists) and non-dental allied health professionals (occupational therapists, nurse oral health coordinators, and health promoters), and follow-up ranged from 3 months to 5 years [114]. Eight of the included primary studies compared combined oral health education with routine care, while one older study from 1989 compared simple oral health education only with routine care. Meta-analysis of the outcomes assessed that related to oral health status, with dental plaque scores and denture plaque scores measured, indicated moderate-certainty evidence. Pooled data from six primary studies reported no difference in mean dental plaque scores between residents in the intervention groups and those receiving routine care. Pooled data from five primary studies also showed no difference in denture plaque scores between residents in the intervention groups compared with residents receiving routine care. The review authors provided a narrative synthesis to examine outcomes related to gingival health, root caries, and denture stomatitis. Three primary studies that examined gingival health using various incomparable measures showed inconsistent results and moderate-certainty evidence at follow-up at 3–6 months. Two primary studies that examined denture-induced stomatitis and the presence of dental root caries showed no apparent differences in residents at follow-up at 18 months. The one primary study that compared oral health education only with routine care, in which both denture plaque and denture stomatitis were examined, reported insufficient evidence of effect on denture plaque scores and no difference in the prevalence of denture stomatitis [114].

Mehta *et al.* reported the effectiveness of oral health education and training for caregivers in institutional settings for older adults, provided by dental health professionals (dentists and dental hygienists) and non-dental allied health professionals (nurses, nurse educators, and health promoters) [115]. Different scales were used across the primary studies in order to measure dental plaque and denture hygiene outcomes at follow-up at 6 months. Pooled data from four primary studies, indicating moderate-certainty evidence,

reported statistically significantly reduced dental plaque scores (SMD: -0.51 ; 95% CI: $-0.76, -0.26$; I^2 : 35%) in the intervention groups compared with usual care. Pooled data from the same four primary studies, indicating low-certainty evidence, reported that denture hygiene significantly improved (SMD: -0.85 ; 95% CI: $-1.53, -0.18$; I^2 : 95%) in the intervention groups.

Salazar *et al.* reported on the effect of oral health interventions for dependent older adults who were long-term care residents or community-dwelling [116]. In addition to oral health promotion and education, this review also examined mechanical interventions, chemical interventions, combined mechanical/chemical interventions, and professional care. As we deemed these interventions not relevant to the purposes of the current overview, we included 17 of the 30 primary studies from this review, i.e. those that included any type of education or training of caregivers, nursing staff, or the residents themselves that was provided by dental health professionals (dentists, dental hygienists, and oral health teams), non-dental allied health professionals (nurses, oral health specialist nurses, nurse educators, health promoters, and mouth care providers), and caregivers. In studies examining long-term care residents, pooled data from nine primary studies, indicating low-certainty evidence, reported a statistically significant reduction in dental plaque (SMD: -0.59 ; 95% CI: $-1.10, -0.09$; I^2 : 86%) in the short term (at 3–6 months follow-up), whether or not periodical supervision (with re-instruction, re-motivation, and guidance) was included. Pooled data from two primary studies, indicating very low-certainty evidence, suggested that there may be some reduction in dental plaque at up to 5 years follow-up. Individually, these two studies provided conflicting results, however. Pooled data from six primary studies, indicating moderate-certainty evidence, reported that oral health education may result in a reduction (SMD: -0.38 ; 95% CI: $-0.59, -0.17$; I^2 : 0%) in gingivitis seen in gingival index scores in the short term, with or without periodical supervision. Pooled data from seven primary studies, indicating moderate-certainty evidence, reported a significant reduction in denture plaque (SMD: -1.20 ; 95% CI: $-1.83, -0.56$; I^2 : 92%) in the short term, with or without periodical supervision. Pooled data from two primary studies, indicating low-certainty evidence, reported a reduction in denture plaque in the longer term (at 2 years follow-up), although only the study that included periodical supervision was significant (MD: -0.95 ; 95% CI: $-1.47, -0.43$). Only one primary study reported oral-health-related quality of life in long-term care facilities, indicating very low-certainty evidence that was automatically downgraded due to the findings coming from a single study. Quality of life was measured using the Geriatric Oral Health Assessment Index (GOHAI), and this primary study reported an improvement in the intervention group at 6 months follow-up compared with control (MD: 3.99; 95% CI: 0.49, 7.49). Only one primary study reported on oral health status in community-dwelling older adults. Comparing combined oral health education with periodical supervision versus no supervision, the findings suggested that supervised intervention may result in a slight reduction in dental plaque and lower gingivitis scores at 3 months follow-up [116].

Table 18 presents a high-level summary of intervention categories and outcomes of oral health promotion interventions for older adults.

Table 18: Main review outcomes for older adults

Review	Intervention category	Outcome	GRADE certainty of evidence†
Dental plaque index			
Albrecht <i>et al.</i> (2016)	OHE + combined versus usual care	No difference in mean dental plaque scores	Moderate
Mehta <i>et al.</i> (2025)	OHE + combined versus usual care	Significantly improved dental plaque scores	Moderate

Review	Intervention category	Outcome	GRADE certainty of evidence†
Salazar <i>et al.</i> (2024)	OHE + combined versus usual care (in long-term care facilities)	Reduction in dental plaque scores (short term)	Low
		Possible reduction in dental plaque scores (longer term)	Very low
Overlap of primary studies‡		Very high overlap	
Denture plaque scores			
Albrecht <i>et al.</i> (2016)	OHE + combined versus usual care	No difference in denture plaque scores	Moderate
Mehta <i>et al.</i> (2025)	OHE + combined versus usual care	Significantly improved denture hygiene	Low
Salazar <i>et al.</i> (2024)	OHE + combined versus usual care (in long-term care facilities)	Reduction in denture plaque scores (short term)	Moderate
		Reduction in denture plaque scores (longer term)	Low
Overlap of primary studies‡		Very high overlap	
Gingival health status			
Albrecht <i>et al.</i> (2016)	OHE + combined versus usual care	Inconsistent gingivitis scores	Moderate (narrative synthesis)
Salazar <i>et al.</i> (2024)	OHE + combined versus usual care (in long-term care facilities)	Reduction in gingivitis (gingival index)	Moderate
Overlap of primary studies‡		Very high overlap	

†GRADE certainty of evidence ratings: High, moderate, low, or very low.

‡Overlap: None (0%), slight (1–5%), moderate (6–10%), high (11–15%), or very high (≥15%).

4 Discussion

4.1 Key findings

We included 22 systematic reviews in this overview of reviews on oral health promotion interventions that aim to promote personal skills development and/or create supportive environments throughout the life-course. Although adulthood is a recognised critical period in the maintenance of good oral health [117,118], none of the included systematic reviews examined oral health promotion in the general adult population and, to the best of our knowledge [119], there is no other existing overview of reviews that addresses this specific population.

The quality of the included reviews varied substantially, and methodological limitations within some of the reviews presented challenges for us in our work to synthesise the evidence. We explicitly chose to include all systematic reviews that met minimum AMSTAR-2 quality eligibility thresholds, managed overlap through CCA calculations and outlined the consequences of including lower-quality reviews leading to potentially inflated effect estimates. We organised the reviews according to the population groups that were targeted by the interventions, rather than by the outcomes of interest. This enabled us to clearly examine the overlap of included trials within these reviews and to identify the most common

health promotion approaches described in each review. As the nature, settings, and components of the interventions that we reviewed varied between the primary studies, we broadly categorised the interventions into five groups, outlined in Section 3.2, which were based on the behaviour-change features described by the review authors: simple oral health education (information and knowledge sharing), theory-based oral health education (behavioural counselling, training, and skills acquisition), oral health education and training (demonstration, instruction, and action planning), oral health education and skills acquisition (hands-on practice, techniques, and monitoring), and combined oral health education (training and skills acquisition).

We evaluated the reported interventions by outcomes of interest that related to oral health status, oral-health-related behaviours, and oral-health-related quality of life. Clinical outcomes – such as plaque scores, gingival health scores, and the presence of cavitated caries – act as proxy measures of effect for the oral health promotion and the behaviour change targeted, but they cannot distinguish what kind of health behaviour or combination of interventions produced the effect observed. Oral-health-related quality of life is recognised as an important adjunct to assessing overall health [18], but we identified very little evidence of this being taken into consideration in the included reviews. Despite including 143 primary studies across 22 systematic reviews, the overview currently provides limited higher-certainty evidence of disease-level benefit (e.g. caries incidence, tooth loss) for specific oral health promotion approaches.

One of the challenges of comparing outcomes is the large range of tools/indices used in order to measure oral health status, some of which may not be comparable. The authors of the systematic reviews provided limited information in relation to how they managed this issue across the included primary studies, other than outlining the limitation that this posed to their ability to pool data, which often led to them not reporting or excluding these indices or simply combining various measures for the same outcome. Where possible, we reported any information provided and reported outcomes as presented.

Both meta-analyses and narrative syntheses contributed to our evaluation, as some reviews pooled data, others presented their findings narratively, and some used both methods to present their findings. The reasons that were given for providing only a narrative synthesis were often related to the heterogeneity of the included primary studies (in terms of population, intervention, and outcomes) and the variety of outcome measures employed across the included primary studies.

Overall, the findings suggest that oral health promotion interventions may have a positive effect on oral health outcomes across the life-course, although good-quality evidence is scarce and the measures used in order to evaluate this positive effect are diverse. In addition, caution is advised when interpreting findings from lower-quality systematic reviews, as higher quality systematic reviews with randomised control trials may report lower effect sizes and lower quality non-randomised trials or observational studies may report higher effect sizes, related to the quality differential itself. The importance of time frames should also be noted, as many effective interventions were not sustained beyond the short term, and those that were maintained for longer appear to benefit from regular reinforcement and reminders. Sections 4.1.1–4.1.3 discuss our findings according to the population groups identified and presented in Sections 3.3–3.5.

4.1.1 Maternal and early childhood

We included seven systematic reviews that reported on oral health promotion and education interventions delivered to pregnant women, new mothers, parents, or other primary caregivers, and reported on their effectiveness for early childhood caries prevention. Different outcome measures/indices were employed in order to ascertain the presence of early childhood caries, such as mean dmfs and/or dmft scores, International Caries Detection and Assessment System (ICDAS) scores,

and clinical examination for presence, rates, and level of caries. The findings and certainty of evidence from the reviews varied considerably. We assessed one review to be of high quality [98], but no reviews that we assessed for this population reported outcomes with high-certainty evidence. The certainty of evidence for early childhood caries prevention reported in the reviews ranged from very low to moderate certainty, assessed using the modified GRADE algorithm [90]. We calculated a moderate degree of overlap of the 20 primary studies included in the outcome assessment. Overlap of this nature presents the risk of data from single studies being over-represented across different reviews [21]. We found that 7 of the 20 included primary studies contributed results to more than 1 review.

Of the three theory-based oral health education interventions, the strongest evidence of effectiveness was reported in the Karande *et al.* [99] review on the effectiveness of motivational interviewing (MI)-based behavioural interventions directed at mothers and their children. Moderate-certainty evidence supports findings of a significant difference observed in dental caries favouring the MI group, as measured using the ICDAS. However, this finding rests on just two pooled primary studies. Colvara *et al.* also reported that MI-based behavioural interventions had a protective effect against dental caries in a pooled analysis of eight primary studies [96]. Only limited narrative evidence in the review by Faghihian *et al.* supported this assertion [97], albeit these two studies share/overlap 37.5% of their evidence base. The results in the Faghihian *et al.* review reported that MI-based behavioural interventions were as effective as traditional oral health education in caries prevention, as no difference in rates of caries was found between these groups. MI as a behavioural change strategy was developed by Rollnick *et al.* [120] as a collaborative facilitative approach to help strengthen people's own motivation and commitment to change. It is important to note the variety of primary study designs and implementation of MI methodology in the included systematic reviews. The number of sessions and the duration of each session delivered varied greatly, making comparison of the interventions difficult to interpret. Given that two of the included systematic reviews are critically low quality and the only moderate-certainty MI finding rests on just two pooled primary studies in the Karande *et al.* review, the case for MI as an effective approach is weak.

We categorised four reviews as simple oral health education interventions. Moderate-certainty evidence supports findings reported in Gomersall *et al.* review, which compared four different oral health education/promotion interventions with pregnant women, new mothers, and other primary caregivers against standard care for preventing early childhood caries [98]. At best, Gomersall *et al.* reported that diet and feeding practice advice for infants and young children may slightly reduce the risk of caries presence in primary teeth and slightly lower mean dmfs scores; however, other oral health education interventions tested reported little to no difference and uncertain evidence compared with usual care. These findings are somewhat contrary to those of the other three included systematic reviews in this intervention group. Saxena *et al.* reported a reduced risk of early childhood caries (albeit with lower-certainty evidence and a poorer AMSTAR 2 quality rating [100]), as did von Helde *et al.* in a narrative synthesis [101]. Abuhaloob *et al.* also reported positive effects on caries prevention when oral health education is incorporated into established maternal and infant health services [95].

It is worth noting that the methodological quality of five of the above seven systematic reviews that evaluated the effectiveness of interventions for early childhood caries prevention was judged to be critically low using our adapted version of AMSTAR 2; only the Gomersall *et al.* systematic review was judged to be of high quality [98]. These findings should therefore be interpreted with caution.

Only two of the reviews [95,101] considered outcomes other than childhood caries prevention in assessing the effectiveness of oral health promotion in this population of pregnant women and new mothers, and also evaluated outcomes that were related to the mothers' own oral health status and related behaviours. Both reviews recognised the potential risks to women's oral health during pregnancy;

however, the von Helde *et al.* review was the only review to examine mothers' periodontal parameters in the two included primary studies [101]. Consequently, little can be determined from this paucity of evidence.

4.1.1.1 Comparisons with other maternal and early childhood research

We did not identify any existing overviews of reviews that specifically evaluated the effectiveness of oral health promotion targeting pregnant women and mothers for the prevention of early childhood caries. We did, however, identify one overview of reviews [121] that evaluated various methods for the prevention of early childhood caries, which was discussed in a previous HRB overview on the primary prevention of dental caries [41]. Like our current overview of reviews and consistent with our findings, Soares *et al.* reported positive outcomes related to interventions for pregnant women and mothers that were related to providing advice on diet and feeding, and also when interventions for maternal and children's oral health promotion are integrated into nursing practice. Similarly, Soares *et al.* judged the methodological quality of most of the included systematic reviews to be critically low.

In relation to MI as a strategy directed at pregnant women and mothers in order to improve children's oral health, we did not identify any existing overviews of reviews. We did, however, identify one overview of reviews [70] that broadly assessed the effectiveness of MI-based interventions for children and their carers. Horta Maya *et al.* included two of the same reviews that we included in our overview of reviews. Congruent with our overview, Horta Maya *et al.* reported considerable heterogeneity of the included studies related to the number of MI sessions and the duration of individual sessions; however, they reported that MI-based interventions were effective in preventing early childhood caries and improving oral hygiene practices.

A recent comprehensive evidence review of the effectiveness of oral health promotion interventions, commissioned by Dental Health Services Victoria in Australia [122], includes a chapter related to pregnant women and mothers of young infants, similar to our overview of reviews. The authors conducted a rapid review of systematic reviews of oral health promotion interventions undertaken in non-clinical or community settings. Various study designs and populations were included in the review, providing multicomponent interventions during the prenatal, postnatal, and early parenthood periods. The authors reported that oral health education interventions that provided oral health education, facilitated skills acquisition, and elicited behaviour change were found to have a mostly positive effect on oral health and caries prevention in this population group.

4.1.2 Children and adolescents

We included 12 systematic reviews that reported on the effectiveness of oral health promotion and education interventions, delivered to schoolchildren and adolescents, on their oral health status and oral health-related behaviours. None of the reviews provided usable data on oral-health-related quality of life. We identified a number of different outcome measures/indices that were employed in order to ascertain various aspects of oral health status, such as oral health assessment using gingival and periodontal health (GI, CPI); oral hygiene assessments using plaque and/or debris levels (OHI-S, PI, DI-S); clinical examination for presence, rates, and level of caries (dmfs/DMFS, dmft/DMFT, ICDAS). Age groups varied across the included reviews, with some including just children aged up to around 12 years, while others extended across the entire age group to include children and adolescents aged up to 19 years. A common feature across most of the included reviews was the setting for intervention delivery. Nine of the 12 reviews reported school-based primary studies, 2 included both school and clinic settings, and 3 reviews did not report where the primary study interventions were delivered.

We assessed one review to be of high quality [102], and none of the reviews we assessed reported outcomes with high-certainty evidence. The certainty of evidence reported across all outcomes measured in the reviews ranged from very low to moderate certainty, assessed using the modified GRADE algorithm [90]. We calculated a moderate degree of overlap of the primary studies included in the assessment of plaque scores and gingival health status. Overlap of this nature presents the risk of data from single studies being over-represented across different reviews [21]. We found that 7 of the 34 primary studies that reported plaque scores contributed results to more than 1 review, regardless of intervention category, and 5 of the 21 primary studies that reported gingival health scores contributed results to more than 1 review. None of the systematic reviews had 100% overlap and each review included unique primary studies. Additional subset CCA calculation by intervention type could reveal greater clarity on whether the findings are drawn from different trials or the same, however, with few systematic reviews in each intervention category we presented findings as a whole. We also calculated a moderate degree of overlap of primary studies – albeit across fewer included systematic reviews – that reported oral health behaviours as an outcome.

As outlined in Section 3.2, we organised the included systematic reviews, based on the examined interventions, into five distinct oral health education intervention types. Our best evidence of effect is drawn from Atif *et al.*'s narrative synthesis of various modalities that we categorised as oral health education and training for maintenance of oral health, indicating moderate-certainty evidence of effect on oral hygiene status, demonstrated through assessment of plaque scores and gingival health scores, with a follow-up time frame of up to 3 months. This review included school-based primary studies utilising various school personnel and dental professionals to deliver a broad range and combinations of interventions, with children ranging in age from 4 to 15 years. Similar positive results were reported in other reviews across the intervention types, albeit with a lower certainty of evidence. Kim and Kim reported significant improvements in plaque and gingival scores following similar school-based interventions involving dental professionals and school personnel in low- and middle-income countries. However, Stein *et al.* reported a significant reduction in plaque scores but no difference in gingival scores following any oral health education modalities incorporating training and skills acquisition, carried out by dental professionals in school-based settings. Gurav *et al.* also examined interventions delivered by dental professionals compared with traditional oral health education, but did not report the settings of the included primary studies. Contrary to Stein *et al.*'s findings, Gurav *et al.* reported no significant improvement in plaque or gingival scores in the intervention groups compared with the traditional teaching methods. Some non-significant positive results were reported in oral hygiene utilising Simplified Oral Hygiene Index (OHI-S) and Simplified Debris Index (DI-S) scores. Xiang *et al.* (2020) reported on primary studies that extended the follow-up period to 6 and 12 months. Xiang *et al.* (2020) reported a significant improvement in both plaque and gingival scores at 6 months with behavioural interventions categorised as oral health education and skills acquisition, but that oral health status reverted back to baseline levels after 1 year unless reinforcement of the messages was provided. They did not provide effect estimates, but suggested that with reinforcement of positive oral health messages, significant improvement in oral health may be maintained for up to 3 years. None of the included reviews reported oral health status beyond 12–18 months.

Fewer reviews reported comparable outcomes measuring the presence of cavitated caries. Our best evidence of effect, irrespective of intervention type, is drawn from He *et al.*'s narrative synthesis of two theory-based oral health education interventions compared with conventional education, indicating low-certainty evidence of effect that reported fewer cavitated carious lesions in the intervention group compared with the control group. However, He *et al.* was the only systematic review in the theory-based category that could contribute usable data. Only Tsai *et al.*'s review concurs with this finding, reporting

significantly fewer newly decayed tooth surfaces following combined oral health education interventions compared with control groups but no difference in the education-only subgroups examined. Both reviews included school- and clinic-based interventions provided by dental professionals, teachers and school personnel, peers, and parents.

There was a dearth of evidence reporting outcomes related to oral health behaviours, with only three reviews that provided comparable data, all providing narrative syntheses and all reporting interventions categorised as oral health education and skills acquisition. Our best evidence of effect is drawn from Priya *et al.*'s review of interventions that we categorised as oral health education and skills acquisition compared with traditional or no intervention, indicating low-certainty evidence of effect on changes in oral health behaviours. The review included school-based primary studies utilising teachers, dental health professionals, and peers to deliver a broad range and combinations of interventions for children ranging in age from 6 to 12 years. Primary studies used questionnaires in order to assess self-reported oral-health-related behaviours. Evidence from two primary studies reported very low-certainty evidence of improved general oral health practice behaviours (unspecified) in the intervention groups compared with controls, with a peer-led group showing the greatest change in mean oral health behaviours scores. Priya *et al.* also reported evidence of increased duration and frequency of toothbrushing and flossing from six primary studies. Xiang *et al.*'s review reported very low-certainty evidence of immediate effects following interventions in the same category (oral health education and skills acquisition) compared with controls, with increased frequency in toothbrushing and decreased smoking habits reported. This review also reported that following behavioural interventions in five studies, all oral health behaviours were reported to have improved after 6–9 months. Shakir *et al.* was the only review that provided usable data on children's dietary habits. In a narrative synthesis of five primary studies, Shakir *et al.* reported a reduction in self-reported sugar intake in the intervention compared with the control groups. Interventions were delivered by dental professionals, school personnel, peers, and parents; however, those delivered by peers showed greater reductions in sugar intake compared with interventions delivered by dentists or teachers.

Overall, this overview of reviews highlights the considerable diversity of approaches and modalities of oral health education and promotion delivered to children and adolescents by an array of school personnel and dental health professionals, with and without the involvement of peers and/or parents. The included systematic reviews provided mixed evidence of mostly positive effects on oral health status and behaviours; however, the diversity of interventions and the lack of long-term follow-up assessment makes it difficult to draw robust conclusions on which approach is best.

4.1.2.1 Comparisons with other children and adolescent research

The World Health Organization's health promoting schools initiative established the importance of schools as ideal settings for oral health education and promotion [123]. Schools provide an efficient and effective setting in which to reach large numbers of children, providing supportive environments and opportunities to develop personal skills. While we did not limit our search to school-based settings, most of the systematic reviews we identified included school-based primary studies. Teachers and school personnel, parents, and peers actively engaged in oral-health-related training in order to deliver a variety of programmes, such as providing information, experiential learning, and drama-based role-playing activities, as outlined across our overview of reviews.

We identified two recent overviews of systematic reviews that limited their search to school-based interventions [67,69]. Many of the reviews reported in these overviews are captured in our overview. Consistent with our findings, Das *et al.* reported mostly positive effects of various multicomponent interventions; however, they noted that the lack of consistent findings and the focus on short-term

outcome assessments limits their assessment of the potential effectiveness of these interventions. Bhadauria *et al.* reported the importance of evaluating multiple systematic reviews in order to gain insight into the effectiveness of similar and disparate interventions, and to highlight discrepancies and deficiencies. Pooled results across different study designs and interventions help to strengthen the evidence base and reinforce findings. Bhadauria *et al.* explored the role of parents, teachers, and peers in delivering oral health education programmes, noting how peer-led programmes can be as effective as dentist- and/or teacher-led interventions, particularly in relation to oral health behaviours.

We examined the recent Australian evidence review on oral health promotion interventions [122] for additional reviews of systematic reviews focused on school-based interventions targeting children and adolescents. Evidence from two of the reviews we identified concur with our findings of limited evidence of the effectiveness of such interventions in reducing dental caries among children and adolescents. The included studies varied in quality, but their findings align closely with the results in our overview: significantly better oral hygiene and oral health status were reported with the use of interactive games and role-play activities in preschool education, and improvements in plaque and gingival scores were associated with the provision of oral hygiene training. In addition, better oral-health-related quality of life was reported as a result of teachers providing supportive environments. Our current overview shares several of the same findings highlighted in this evidence review, such as the value of theory-based oral health education sessions, repeated instruction and demonstration, and the use of multimodal educational materials targeting younger and older schoolchildren and adolescents.

4.1.3 Older adults

We included three systematic reviews that reported on oral health promotion and education interventions delivered to older adults and/or caregivers, and that reported on the effect that these interventions had on oral health status, oral-health-related behaviours, and/or oral-health-related quality of life. Taken together, the reviews focused mainly on those in residential care and on the educational interventions, training, and opportunities to acquire skills in oral healthcare that were provided to care home staff, residents of long-term care facilities, community-dwelling individuals, and carers. Only one of the reviews included community-dwelling older people, albeit with a focus on those who were more vulnerable and were dependent on care provided by others. Outcomes were measured in the older adults towards whom the interventions were targeted. A wide variety of educational tools and modalities were utilised in the individual primary studies, and a diverse range of providers were involved, including dental and non-dental health professionals and multi-care providers. In addition to dental plaque scores, all three reviews examined denture health as an important outcome of interest in this population group.

Quality rating across the reviews was inconsistent, as we assessed one review to be of high quality and the remaining two to be of low quality using the AMSTAR 2 tool. In line with the other population groups in our overview, we assessed the certainty of evidence reported across all outcomes measured; this ranged from very low to moderate certainty, as assessed using the modified GRADE algorithm [90]. With the inclusion of only three systematic reviews, we expected a high degree of overlap of included primary studies across the measured outcomes of interest, which we confirmed with the calculation of a very high degree of overlap across dental plaque, denture plaque, and gingival health outcomes. Overlap of this nature presents the risk of data from single primary studies being over-represented across different reviews [21]. We observed that many of the same primary studies were presented in all three reviews, limiting the breadth of the evidence and suggesting an over-reliance on few studies. However, four of the primary studies included in Albrecht *et al.* are also included in the more recent reviews, and despite Salazar *et al.* including an additional seven unique studies, overlap remained very high. These three systematic reviews represent different time periods rather than three independent assessments of the

same body of evidence. Consistent findings across some of the included reviews may reflect shared sources rather than genuinely independent similarity.

Despite the significant overlap of primary studies, positive findings reported in the reviews by Mehta *et al.* and Salazar *et al.* contrast with those reported in the earlier review carried out by Albrecht *et al.*, which reported little or no difference in mean dental and denture plaque scores. While these conflicting reports may be explained by methodological differences in the quality of the reviews and the certainty of evidence indicated, the divergence in findings between reviews may also highlight a genuine uncertainty in the field. The high degree of overlap and contrasting findings signal constraints within this topic field and underscore the need for more robust primary research.

4.1.3.1 Comparisons with other older adult research

A recent scoping review [124] exposed substantial gaps in our current knowledge and understanding of effective oral health promotion and education for older adults (lack of policies and guidelines, lack of information and research regarding the most effective interventions), despite the critical importance oral health plays in healthy ageing. The review included 62 published studies that identified various educational and practical interventions on oral health for individual older adults and care providers; however, consistent with our findings, many varied in quality and size, rarely measured long-term outcomes, and focused on long-term care facilities.

We identified one recent overview of systematic reviews that was limited to interventions delivered by care workers to nursing home residents [68]. Caregiver training and tailored care with input from dental health professionals was reported as the most effective intervention; however, the review authors reported that individual interventions were poorly described and that methodological quality was mixed. Taken together with our findings, it would appear that oral health promotion is being provided and may be effective for frail older adults, although most of the evidence relates to residents in long-term care facilities.

4.2 Strengths and limitations

To our knowledge, this is the first overview of reviews to comprehensively examine the effectiveness of oral health promotion programmes across diverse populations, interventions, and settings. While other overviews have addressed oral health promotion, they have typically focused on specific populations, particular intervention types, or defined settings, limiting their scope. We chose an overview of reviews design in order to allow us to capture the full breadth of relevant oral health promotion programmes, which would not have been feasible within a traditional systematic review in the available time frame.

We note that when findings are restricted to the three high-quality systematic reviews [98,102,114], the evidence base shows at best slight benefit from diet/feeding advice in the maternal group, directional positive signals without quantifiable effect sizes for children, and no demonstrated effect on plaque outcomes for older adults at moderate certainty.

Our review does not address the broader health inequalities, fluoridation and the populations consumption of sugar. We acknowledge that oral health is influenced by these broader social determinants of health which contribute to disparities in oral health behaviours, common risk factors and access to oral health preventive and treatment services. Achieving better oral health requires comprehensive public health action [17]. While beyond the scope of the current overview of reviews, we recognise the need for a better understanding of the impact of social determinants of health in the evaluation of effective oral health promotion.

Methods for overviews of reviews are continually evolving, and we consulted best-practice guidance provided by the leading thinkers in this area in order to develop our approach, tailoring our methods where necessary [42,46]. We carefully considered the methodology employed for the overview of review searches, with the intention of capturing all relevant studies that would best answer the review question relevant to policy-makers and public health officials in Ireland. The principal strength of the searches we conducted is that they were expert, peer-reviewed, and comprehensive; the searches were employed using best practice across a range of relevant databases and sources, all of which strengthens the validity of the search results. Although we deliberately included Spanish, Portuguese, and Latin American databases (SciELO, BIREME/LILACS, BBO) and used non-English search terms specifically to capture international research, we excluded two non-English SRs found through those searches as we were unable to access verifiable English translations. We consider this a limitation and record the excluded reviews in Appendix C.

Staging the searches in order to match the process of the review – including scoping searches, main database searches, supplementary and grey literature searches, and backward and forward citation chasing – enabled us to capture as much relevant material as possible, thereby mitigating the risk of relevant research being missed. We acknowledge the limitations and risk of error with single reviewer extraction as standard practice, and in order to mitigate this our extraction tool included additional notes (in order to ensure that all reviewers undertaking extraction made decisions using the same parameters), we used a copy and paste approach to maintain accuracy of data extracted, and data were then validated by the second reviewer. This approach was adopted for pragmatic reasons, given the scale and nature of overviews and the time restrictions. As standard practice in previous HRB overviews, this approach has been shown to offer a reasonable balance between methodological rigour and efficiency in evidence synthesis.

While our overview was conducted in accordance with best-practice guidance for overviews of reviews, it is vulnerable to some of the limitations inherent to this form of evidence synthesis [42,46]. Reporting bias at the level of the systematic review evidence base was not independently investigated beyond our employment of the AMSTAR-2 publication-bias domain. Updated overlap calculation methods incorporate four additional elements for a complete overlap analysis of primary studies across included systematic reviews that may materially change the outcomes [50]. In addition, organising our findings by intervention category and overlap by outcome measures, limits the possibility of drawing conclusions about any specific intervention type.

Overviews of systematic reviews inherently suffer from a time lag in capturing the most recent primary research. Primary studies published 2–3 years prior to our overview are unlikely to be included, as insufficient time would have elapsed for them to be incorporated into published systematic reviews.

Finally, and most significantly, the validity of findings in any overview of reviews is fundamentally dependent on the methodological quality of the included systematic reviews. Although we implemented rigorous screening procedures in order to exclude low-quality work (see Section 2.3 on eligibility criteria and Section 2.5 on study selection), we cannot overcome weaknesses within the underlying body of evidence through the overview process alone. Errors in data extraction from primary studies to systematic reviews may have occurred that were difficult or impossible to detect without directly scrutinising the primary studies themselves and comparing them against the systematic reviews' reporting. The nature of overviews of reviews means that we, as overview authors, are one step further removed from the original research than systematic review authors. Consequently, important methodological nuances or interpretative details from the primary studies may be obscured or lost in translation through this layered synthesis process. For example, we have not consistently provided

information on the topic content of the education interventions e.g. diet, oral hygiene. Consequently, we have not made comparisons related to the topic of education interventions

4.3 Future research

Our overview highlights several important priorities for future research in population-based oral health promotion. Notably, we identified limited evidence examining oral health promotion interventions in the general adult population, despite adulthood being recognised as a critical period for maintaining good oral health. Pregnancy is a period of elevated periodontal risk. Despite this, we identified no systematic reviews examining oral health promotion with maternal oral health as a primary endpoint. Future research would benefit from addressing these gaps, as well as expanding the evidence base for older adults and their caregivers as independent living older adults are absent from the evidence base.

Second, there is scope for enhancing the methodological quality of systematic reviews in this field. Future reviews could employ more comprehensive approaches, particularly in conducting thorough risk of bias assessments, applying the GRADE methodology in order to evaluate the certainty of evidence, and striving for higher standards on AMSTAR 2 quality criteria. Given that only 3 of our 22 included reviews were rated as high quality and none reported high-certainty evidence for any outcome, these methodological enhancements would strengthen the evidence base.

Third, primary research with extended follow-up periods would be valuable, as our findings reveal that most interventions were not evaluated beyond 12–18 months, and many short-term improvements in oral health status and behaviours were not sustained without regular reinforcement during the evaluation period. Longitudinal studies examining whether intervention effects are maintained over multiple years would provide important evidence for policy and practice.

Fourth, the field would benefit from greater standardisation in several key areas: outcome measurement (given the diverse indices used in order to assess plaque, gingival health, and caries), intervention reporting in general needs to include what constitutes an effective dose – how much, how often and for how long (particularly for MI approaches where the number and duration of sessions varied substantially across studies), as well as reporting of who provides/delivers the interventions (including sub-group analysis of the different providers, where appropriate), and the development of core outcome sets that would facilitate meaningful comparison across studies and reduce the moderate overlap of primary studies across reviews that we observed. In addition, given the shift toward artificial intelligence (AI) and digital health interventions, future research would be useful to evaluate the effectiveness of these modalities as a priority.

As previously stated, our overview does not address the broader health inequalities, fluoridation and the populations consumption of sugar. Future evidence reviews could examine the effectiveness of regulation such as fluoridation and sugar sweetened beverage taxation and oral health risk factor related policy, such as food policy.

Finally, future research could expand beyond clinical outcomes to evaluate oral-health-related behaviours and oral-health-related quality of life, both of which were relatively underreported in the included reviews. Clinical and educational efforts alone are insufficient, therefore, for a better understanding of oral health promotion strategies, future research needs to encompass the impact of social determinants of health, in the evaluation of effective oral health promotion.

4.4 Policy implications

In Ireland, our oral health promotion landscape is shaped within *Smile agus Sláinte: National Oral Health Policy* [35], supported and aligned with *Healthy Ireland: A Framework for Improved Health and Wellbeing*

2013–2025 [37]. In order to optimise oral health promotion across the life-course and focus on preventive care, as outlined in the national oral health policy, greater attention to the working components as set out by the template for intervention description and evaluation of effective interventions is warranted [125]. This overview of systematic reviews provides a substantial contribution to this discussion and highlights the lack of consistent, high-certainty evidence across reviews. No evidence-based programmes were identified in the general adult population, and this gap represents an urgent primary research priority in order to establish recommendations for policy.

In developing the theoretical framework [126] for *Smile agus Sláinte: National Oral Health Policy*, three pillars or approaches were identified: (1) adopting a life-course approach, which highlights critical periods of growth and development in children and adolescents, and times of greater risk and vulnerability in older age; (2) adopting a common risk factor approach, which acknowledges the commonality of risk factors across other common chronic conditions; and (3) embedding both approaches within a primary-care-oriented health system, where prevention and care are delivered in the most appropriate community settings. The findings of our overview align closely with these pillars. At the earliest stages of the life-course, we identified reviews demonstrating the value of integrating oral health promotion into pre- and postnatal maternal services, delivered by a range of oral health and non-oral health professionals as well as trained community volunteers. At the other end of the spectrum, reviews focusing on dependent older adults highlight the importance of education and training for caregivers and health professionals, to improve oral health and mitigate the consequences of poor oral health in later life. We found that the largest concentration of evidence was related to school-based health promotion for children and adolescents, involving school personnel, parents, and peers, along with dental health professionals. Collectively, these findings illustrate how oral health promotion can effectively integrate into general health and social care systems across the life-course, be delivered by diverse personnel, and be embedded within community settings, directly supporting the overarching aims of *Smile agus Sláinte: National Oral Health Policy*.

The evidence we identified in our overview demonstrates that oral health promotion is not confined to dental settings or oral health professionals. As outlined in Sections 3.3–3.5, many of the interventions reported were delivered by midwives, nurses, primary care teams, dieticians, community therapists, teachers, school personnel, carers, parents, and trained community volunteers. This reflects a broader public health orientation, where health behaviours can be influenced by opportunistic brief interventions that are delivered in everyday settings. These findings align with the Health Service Executive’s Making Every Contact Count (MECC) training programme [39], which is built on the idea that any health or social care interaction is an opportunity for brief, evidence-based behaviour change support. It explicitly extends beyond specialist services and encourages all trained personnel to deliver simple, preventive messages. The diversity of personnel involved in the delivery of the reported interventions suggests that these oral health promotion messages can be integrated into broader health encounters in a manner that is consistent with the MECC approach. However, while the interventions identified suggest that oral health promotion can be delivered beyond dental settings, the evidence for such delivery is predominantly low to very low-certainty, and does not permit definitive conclusions about effectiveness of non-dental delivery at intervention level. Review reporting restricted our ability to discern the interventions delivered by dental providers in dental settings and to compare them with interventions provided by non-dental providers.

4.5 Conclusion

In order to address the Department of Health’s research question regarding the effectiveness of population-based oral health promotion programmes, we included 22 systematic reviews in this overview

of reviews. Included reviews reported on oral health promotion programmes directed at individuals, healthcare professionals, and/or carers (family/formal carers) in order to help prevent oral disease and promote better oral health across maternal and early childhood, children and adolescents, and older adult populations.

Overall, the findings suggest that oral health promotion interventions may have a positive effect on oral health outcomes across the life-course; however, good-quality evidence is scarce, and the measures used in order to evaluate the effect of the interventions are diverse. The certainty of evidence was predominantly very low to moderate across all population groups and outcomes, with no outcomes supported by high-certainty evidence. Of note, the moderate-certainty findings encompass high-quality systematic reviews with findings reporting no statistically significant effect of the intervention and low or critically low-quality systematic reviews with mostly positive findings.

For maternal and early childhood populations, MI-based interventions demonstrated moderate-certainty evidence of effectiveness for early childhood caries prevention, based on two primary studies from a critically low-quality systematic review. In addition, positive findings from the two other MI-based systematic reviews share more than a third of their primary study pool. Implementation varied in terms of the number and duration of sessions. Simple oral health education providing diet and feeding advice showed moderate-certainty evidence of slight reductions in caries risk. For children and adolescents, oral health education and training delivered in school settings by various personnel (teachers, dental health professionals, peers, and parents) showed moderate-certainty evidence of improved oral hygiene status in the short term. Oral health interventions with education and skills development showed promise for behaviour change, with peer-led programmes demonstrating particular effectiveness, albeit derived from low-quality reviews, at very low-certainty. For older adults in residential care, combined education and training approaches for caregivers and residents showed contradictory findings from different time periods, with different populations of trials. Two recent reviews reporting significant improvements in dental and denture hygiene are from low-quality systematic reviews, while an earlier higher quality review found no difference for the intervention group compared with usual routine care.

Many effective interventions were not sustained beyond the short term (3–6 months), and those that maintained effectiveness appeared to benefit from regular reinforcement and reminders. The diversity of intervention types, outcome measures, and follow-up periods, combined with methodological limitations of the included reviews and the substantial overlap of primary studies in some areas, makes it challenging to draw definitive conclusions about the most effective approaches.

There is a notable absence of evidence for the general adult population, despite adulthood being a critical period for oral health maintenance. Additionally, very little evidence assessed oral-health-related behaviours and oral-health-related quality of life across all populations, despite these being important adjuncts to overall health assessment.

References

- 1 Hennekens CH, Buring JE. *Epidemiology in medicine*. Boston: Lippincott Williams & Wilkins 1987.
- 2 Machiulskiene V, Campus G, Carvalho JC, *et al*. Terminology of dental caries and dental caries management: Consensus report of a workshop organized by ORCA and Cariology Research Group of IADR. *Caries Res* 2020;**54**:7–14. doi: <https://doi.org/10.1159/000503309>
- 3 Marinho VCC, Chong LY, Worthington HV, *et al*. Fluoride mouthrinses for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2016;**7**:CD002284. doi: <https://doi.org/10.1002/14651858.CD002284.pub2>
- 4 Fernando S, Tadakamadla S, Kroon J, *et al*. Predicting dental caries increment using salivary biomarkers in a remote Indigenous Australian child population. *BMC Oral Health* 2021;**21**:372. doi: <https://doi.org/10.1186/s12903-021-01702-0>
- 5 Borges BCD, de Souza Borges J, Braz R, *et al*. Arrest of non-cavitated dentinal occlusal caries by sealing pits and fissures: a 36-month, randomised controlled clinical trial. *Int Dent J* 2012;**62**:251–5. doi: <https://doi.org/10.1111/j.1875-595X.2012.00117.x>
- 6 Dhingra K, Vandana KL. Indices for measuring periodontitis: a literature review. *Int Dent J* 2011;**61**:76–84. doi: <https://doi.org/10.1111/j.1875-595X.2011.00018.x>
- 7 Vos T, Abajobir AA, Abate KH, *et al*. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet* 2017;**390**:1211–59. doi: [https://doi.org/10.1016/S0140-6736\(17\)32154-2](https://doi.org/10.1016/S0140-6736(17)32154-2)
- 8 Walsh T, Worthington HV, Glenny A-M, *et al*. Fluoride toothpastes of different concentrations for preventing dental caries. *Cochrane Database Syst Rev* 2019;**3**:CD007868. doi: <https://doi.org/10.1002/14651858.CD007868.pub3>
- 9 Worthington HV, MacDonald L, Poklepovic Pericic T, *et al*. Home use of interdental cleaning devices, in addition to toothbrushing, for preventing and controlling periodontal diseases and dental caries. *Cochrane Database Syst Rev* 2019;**4**:CD012018. doi: <https://doi.org/10.1002/14651858.CD012018.pub2>
- 10 Loe H, Silness J. Periodontal disease in pregnancy. i. prevalence and severity. *Acta Odontol Scand* 1963;**21**:533–51.
- 11 Shivakumar K, Prasad S, Chandu G. International Caries Detection and Assessment System: A new paradigm in detection of dental caries. *J Conserv Dent JCD* 2009;**12**:10–6. doi: <https://doi.org/10.4103/0972-0707.53335>
- 12 National Library of Medicine. Dentition, mixed. MeSH Descriptor data 2026. 2026. <https://meshb.nlm.nih.gov/record/ui?ui=D003818> (accessed 17 Feb 2026).
- 13 Miller WR, Rollnick S. Ten things that motivational interviewing is not. *Behav Cogn Psychother* 2009;**37**:129–40.
- 14 Nakre PD, Harikiran AG. Effectiveness of oral health education programs: A systematic review. *J Int Soc Prev Community Dent* 2013;**3**:103–15. doi: <https://doi.org/10.4103/2231-0762.127810>

- 15 Saito M, Shimazaki Y, Fukai K, *et al.* A multilevel analysis of the importance of oral health instructions for preventing tooth loss: The 8020 Promotion Foundation Study of Japanese Dental Patients. *BMC Oral Health* 2020;**20**:328. doi: <https://doi.org/10.1186/s12903-020-01319-9>
- 16 Chang CP, Barker JC, Hoeft KS, *et al.* Importance of content and format of oral health instruction to low-income mexican immigrant parents: a qualitative study. *Pediatr Dent* 2018;**40**:30–6. <https://www.ingentaconnect.com/content/aapd/pd/2018/00000040/00000001/art00006>
- 17 Watt RG. Strategies and approaches in oral disease prevention and health promotion. *Bull World Health Organ* 2005;**83**:711–8. <https://pubmed.ncbi.nlm.nih.gov/articles/PMC2626336/>
- 18 Baiju RM, Peter E, Varghese NO, *et al.* Oral health and quality of life: current concepts. *J Clin Diagn Res JCDR* 2017;**11**:ZE21–6. doi: <https://doi.org/10.7860/JCDR/2017/25866.10110>
- 19 World Health Organization, Health and Welfare Canada, Canadian Public Health Association. Ottawa charter for health promotion. Ottawa, Canada: World Health Organization 1986. <https://www.canada.ca/content/dam/phac-aspc/documents/services/health-promotion/population-health/ottawa-charter-health-promotion-international-conference-on-health-promotion/charter.pdf> (accessed 18 May 2026).
- 20 World Health Organization. First International Conference on Health Promotion, Ottawa, 21 November 1986. <https://www.who.int/teams/health-promotion/enhanced-wellbeing/first-global-conference> (accessed 5 May 2026).
- 21 Pieper D, Antoine S-L, Mathes T, *et al.* Systematic review finds overlapping reviews were not mentioned in every other overview. *J Clin Epidemiol* 2014;**67**:368–75. doi: <https://doi.org/10.1016/j.jclinepi.2013.11.007>
- 22 National Library of Medicine. Dentition, permanent. MeSH descriptor data 2026. 2026. <https://meshb.nlm.nih.gov/record/ui?ui=D019229> (accessed 17 Feb 2026).
- 23 Silness J, Løe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964;**22**:121–35. doi: <https://doi.org/10.3109/00016356408993968>
- 24 Tafti A, Clark P. Anatomy, head and neck, primary dentition. In: *StatPearls [Internet]*. StatPearls Publishing 2023. <https://www.ncbi.nlm.nih.gov/sites/books/NBK573074/> (accessed 17 Feb 2026).
- 25 Katz RV. Assessing root caries in populations: the evolution of the root caries index. *J Public Health Dent* 1980;**40**:7–16. doi: <https://doi.org/10.1111/j.1752-7325.1980.tb01844.x>
- 26 Usuga-Vacca M, Marin-Zuluaga DJ, Castellanos JE, *et al.* Association between root/coronal caries and individual factors in institutionalised elderly using ICDAS severity and activity. *BMC Oral Health* 2021;**21**:146. doi: <https://doi.org/10.1186/s12903-021-01520-4>
- 27 Cai J, Palamara J, Manton D, *et al.* Status and progress of treatment methods for root caries in the last decade: a literature review. *Aust Dent J* 2018;**63**:34–54. doi: <https://doi.org/10.1111/adj.12550>
- 28 Hellyer P. Root caries. *Br Dent J* 2021;**231**:32. doi: <https://doi.org/10.1038/s41415-021-3234-2>
- 29 World Health Organization. Oral health. 2025. <https://www.who.int/health-topics/oral-health> (Archived in the Internet Archive at: https://web.archive.org/web/20250814125435/https://www.who.int/health-topics/oral-health#tab=tab_1 on 14 Aug 2025)

- 30 World Health Organization. Health promotion. 2016. <https://www.who.int/news-room/questions-and-answers/item/health-promotion> (Archived in the Internet Archive at: <https://web.archive.org/web/20250814131904/https://www.who.int/news-room/questions-and-answers/item/health-promotion> on 14 Aug 2025)
- 31 Fisher J, Berman R, Buse K, *et al.* Achieving oral health for all through public health approaches, interprofessional, and transdisciplinary education. *NAM Perspect*;2023;10.31478/202302b. doi: <https://doi.org/10.31478/202302b>
- 32 Elyassi M. An introduction to oral health promotion. *BDJ Team* 2022;9:26–7. doi: <https://doi.org/10.1038/s41407-022-0993-9>
- 33 Petersen PE. World Health Organization global policy for improvement of oral health--World Health Assembly 2007. *Int Dent J* 2008;58:115–21. doi: <https://doi.org/10.1111/j.1875-595x.2008.tb00185.x>
- 34 Yevlahova D, Satur J. Models for individual oral health promotion and their effectiveness: a systematic review. *Aust Dent J* 2009;54:190–7. doi: <https://doi.org/10.1111/j.1834-7819.2009.01118.x>
- 35 Department of Health. Smile agus Sláinte National Oral Health Policy. Dublin, Ireland: Department of Health 2019. <https://assets.gov.ie/static/documents/smile-agus-slainte-national-oral-health-policy-40e3a896-7d4f-4c1e-a6cc-c18316e10571.pdf>
- 36 World Health Organization. Global strategy and action plan on oral health 2023–2030. Geneva: World Health Organization 2024. <https://www.who.int/publications/i/item/9789240090538>
- 37 Department of Health. Healthy Ireland - a framework for improved health and wellbeing 2013 - 2025. Dublin: Department of Health 2013. <https://www.hse.ie/eng/services/publications/corporate/hienglish.pdf>
- 38 Ipsos. Healthy Ireland survey 2022 Summary report. Ireland: Department of Health 2023. <https://assets.gov.ie/static/documents/healthy-ireland-survey-report-2022.pdf>
- 39 O’Brien M, Scott A. Making every contact count. A health behaviour change framework and implementation plan for health professionals in the Irish health service. Dublin, Ireland: Health Service Executive 2016. <https://discoveryzone.hsland.ie/media/puxdznl/making-every-contact-count-framework.pdf>
- 40 Long J, Waldron C, Farragher A, *et al.* Effect of artificial community water fluoridation on dental health. An evidence review. Dublin, Ireland: Health Research Board 2025. <https://www.hrb.ie/publication/effect-of-artificial-community-water-fluoridation-on-dental-health-an-evidence-review/>
- 41 Murphy L, Farragher L, Clements K, *et al.* Primary prevention of dental caries: An evidence review. Dublin, Ireland: Health Research Board 2023. <https://www.hrb.ie/publication/primary-prevention-of-dental-caries-an-evidence-review-4/>
- 42 Aromataris E, Fernandez R, Godfrey C, *et al.* 9. Umbrella reviews. In: Aromataris E, Lockwood C, Porritt K, *et al.*, eds. *Manual for Evidence Synthesis*. JBI 2020. 366pp. doi: <https://doi.org/10.46658/JBIMES-24-01>
- 43 Pollock M, Fernandes RM, Becker LA, *et al.* Chapter V: Overviews of reviews. In: *Cochrane Handbook for Systematic Reviews of Interventions version 6.5*. Cochrane 2024. <https://www.cochrane.org/authors/handbooks-and-manuals/handbook/current/chapter-v>

- 44 Gates M, Gates A, Guitard S, *et al.* Guidance for overviews of reviews continues to accumulate, but important challenges remain: a scoping review. *Syst Rev* 2020;**9**:254. doi: <https://doi.org/10.1186/s13643-020-01509-0>
- 45 Hall P, Moloney T, Lee C, *et al.* Population-based oral health promotion programmes to prevent onset of oral diseases and improve oral health: an overview of reviews. CRD420251173490. PROSPERO. National Institute for Health and Care Research 2025. <https://www.crd.york.ac.uk/PROSPERO/view/CRD420251173490>
- 46 Gates M, Gates A, Pieper D, *et al.* Reporting guideline for overviews of reviews of healthcare interventions: development of the PRIOR statement. *BMJ* 2022;**378**:e070849. doi: <https://doi.org/10.1136/bmj-2022-070849>
- 47 Pérez-Bracchiglione J, Meza N, Bangdiwala SI, *et al.* Graphical Representation of Overlap for OVERviews: GROOVE tool. *Res Synth Methods* 2022;**13**:381–8. doi: <https://doi.org/10.1002/jrsm.1557>
- 48 Hennessy EA, Johnson BT. Examining overlap of included studies in meta-reviews: guidance for using the corrected covered area index. *Res Synth Methods* 2020;**11**:134–45. doi: <https://doi.org/10.1002/jrsm.1390>
- 49 Pollock A, Campbell P, Brunton G, *et al.* Selecting and implementing overview methods: implications from five exemplar overviews. *Syst Rev* 2017;**6**:145. doi: <https://doi.org/10.1186/s13643-017-0534-3>
- 50 Bracchiglione J, Meza N, Pieper D, *et al.* Impact of matrix-construction assumptions on quantitative overlap assessment in overviews: A meta-research study. *Res Synth Methods* 2026;**17**:348–64. doi: <https://doi.org/10.1017/rsm.2025.10056>
- 51 Fernandez RS, Sharifnia AM, Khalil H. Umbrella reviews: a methodological guide. *Eur J Cardiovasc Nurs* 2025;:zvaf012. doi: <https://doi.org/10.1093/eurjcn/zvaf012>
- 52 Centre for Reviews and Dissemination. *Systematic reviews. CRD's guidance for undertaking reviews in health care*. York: Centre for Reviews and Dissemination 2009. https://www.york.ac.uk/media/crd/Systematic_Reviews.pdf
- 53 Lunny C, Brennan SE, McDonald S, *et al.* Toward a comprehensive evidence map of overview of systematic review methods: paper 1-purpose, eligibility, search and data extraction. *Syst Rev* 2017;**6**:231. doi: <https://doi.org/10.1186/s13643-017-0617-1>
- 54 Lefebvre C, Glanville J, Briscoe S, *et al.* Chapter 4: Searching for and selecting studies. In: Higgins JPT, Thomas J, Chandler J, *et al.*, eds. *Cochrane Handbook for Systematic Reviews of Interventions version 6.5.1 (updated March 2025)*. Cochrane 2025. <https://www.cochrane.org/authors/handbooks-and-manuals/handbook/current/chapter-04>
- 55 Frandsen TF, Nielsen MFB, Eriksen MB. Avoiding searching for outcomes called for additional search strategies: A study of Cochrane review searches. *J Clin Epidemiol* 2022;**149**:83–8. doi: <https://doi.org/10.1016/j.jclinepi.2022.05.015>
- 56 Aali G, Shokrane F. No limitations to language, date, publication type, and publication status in search step of systematic reviews. *J Clin Epidemiol* 2021;**133**:165–7. doi: <https://doi.org/10.1016/j.jclinepi.2021.02.002>

- 57 Pieper D, Puljak L. Language restrictions in systematic reviews should not be imposed in the search strategy but in the eligibility criteria if necessary. *J Clin Epidemiol* 2021;**132**:146–7. doi: <https://doi.org/10.1016/j.jclinepi.2020.12.027>
- 58 Stern C, Kleijnen J. Language bias in systematic reviews: you only get out what you put in. *JBIM Evid Synth* 2020;**18**:1818. doi: <https://doi.org/10.11124/JBIES-20-00361>
- 59 Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Inf Libr J* 2009;**26**:91–108. doi: <https://doi.org/10.1111/j.1471-1842.2009.00848.x>
- 60 InterTASC Information Specialists' Sub-Group. InterTASC Information Specialists' Sub-Group Search Filter Resource. 2025. <https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home> (Archived in the Internet Archive at: <https://web.archive.org/web/20250814133316/https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home> on 14 Aug 2025)
- 61 Canada's Drug Agency. L'Agence des médicaments du Canada. Canada's Drug Agency search filters database. SR / MA / HTA / ITC - MEDLINE, Embase, PsycInfo. 2023. <https://searchfilters.cda-amc.ca/link/33>
- 62 Canada's Drug Agency. L'Agence des médicaments du Canada. Canada's Drug Agency search filters database. SR / MA / HTA / ITC - CINAHL. 2023. <https://searchfilters.cda-amc.ca/link/98>
- 63 Canadian Health Libraries Association. Literature reviews and meta-analyses [Biblio3S]. 2018. <https://extranet.santecom.qc.ca/wiki/!biblio3s/doku.php?id=concepts:revues-de-la-litterature-et-meta-analyses> (accessed 15 May 2026).
- 64 Sebo P, Lucia S de. Performance of machine translators in translating French medical research abstracts to English: A comparative study of DeepL, Google Translate, and CUBBITT. *PLOS ONE* 2024;**19**:e0297183. doi: <https://doi.org/10.1371/journal.pone.0297183>
- 65 Hirt J, Nordhausen T, Fuerst T, et al. Guidance on terminology, application, and reporting of citation searching: the TARCIS statement. *BMJ* 2024;**385**:e078384. doi: <https://doi.org/10.1136/bmj-2023-078384>
- 66 Horsley T, Dingwall O, Sampson M. Checking reference lists to find additional studies for systematic reviews. *Cochrane Database Syst Rev* 2011;:MR000026. doi: <https://doi.org/10.1002/14651858.MR000026.pub2>
- 67 Bhadauria US, Priya H, Purohit B, et al. Effectiveness of school oral health programs in children and adolescents: an umbrella review. *Evid Based Dent* 2024;**25**:211–211. doi: <https://doi.org/10.1038/s41432-024-01013-7>
- 68 Csikar J, Edwebi S, Vinall-Collier K, et al. Oral health interventions and strategies delivered by care workers to older people living in care homes: an overview of systematic reviews. *BMC Oral Health* 2025;**25**:1574. doi: <https://doi.org/10.1186/s12903-025-06943-x>
- 69 Das H, Janakiram C, SVK, et al. Effectiveness of school-based oral health education interventions on oral health status and oral hygiene behaviors among schoolchildren: an umbrella review. *Evid Based Dent* 2025;**26**:110–1. doi: <https://doi.org/10.1038/s41432-024-01101-8>
- 70 Horta Maya AM, Gutiérrez Gutiérrez LF, Martínez Delgado CM, et al. Motivational interviewing as a strategy to improve the oral health of children and caregivers. Umbrella review. *Rev Pediatría Aten Primaria* 2024;**26**:e1–12. doi: <https://doi.org/10.60147/2cb1e384>

- 71 Janakiram C, James A, Vattiprolu SV, *et al.* Supervised toothbrushing programs: evaluating impact, barriers, and facilitators - a mixed-method umbrella review. *Evid Based Dent* Published Online First: 2025. doi: <https://doi.org/10.1038/s41432-025-01178-9>
- 72 Sanghavi B, Sachdev SS, Sachdev JB, *et al.* Social media as a tool for oral health promotion: an umbrella review of systematic reviews and content-analysis studies across digital platforms. *Cureus* 2025;**17**:e87962. doi: <https://doi.org/10.7759/cureus.87962>
- 73 Sardana D, Ritto FP, Ciesla D, *et al.* Evaluation of oral health education programs for oral health of individuals with visual impairment: An umbrella review. *Spec Care Dent Off Publ Am Assoc Hosp Dent Acad Dent Handicap Am Soc Geriatr Dent* 2023;**43**:751–64. doi: <https://doi.org/10.1111/scd.12873>
- 74 Sohn W, Ismail AI, Tellez M. Efficacy of educational interventions targeting primary care providers' practice behaviors: an overview of published systematic reviews. *J Public Health Dent* 2004;**64**:164–72. doi: <https://doi.org/10.1111/j.1752-7325.2004.tb02747.x>
- 75 Briscoe S. Web searching for systematic reviews: a case study of reporting standards in the UK Health Technology Assessment programme. *BMC Res Notes* 2015;**8**:153. doi: <https://doi.org/10.1186/s13104-015-1079-y>
- 76 Haddaway NR, Collins AM, Coughlin D, *et al.* The role of Google Scholar in evidence reviews and Its applicability to grey literature searching. *PLoS ONE* 2015;**10**:e0138237. doi: <https://doi.org/10.1371/journal.pone.0138237>
- 77 National Library of Medicine. MeSH Browser. 2024. <https://meshb.nlm.nih.gov/search>
- 78 Koster J, Academisch Medisch Centrum, Universiteit van Amsterdam, Amsterdam, Netherlands. Pubmed PubReminer [Software]. 2019. <https://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi>
- 79 McGowan J, Sampson M, Salzwedel DM, *et al.* PRESS Peer Review of Electronic Search Strategies: 2015 guideline statement. *J Clin Epidemiol* 2016;**75**:40–6. doi: <https://doi.org/10.1016/j.jclinepi.2016.01.021>
- 80 Polanin JR, Pigott TD, Espelage DL, *et al.* Best practice guidelines for abstract screening large-evidence systematic reviews and meta-analyses. *Res Synth Methods* 2019;**10**:330–42. doi: <https://doi.org/10.1002/jrsm.1354>
- 81 Thomas J, Graziosi S, Brunton J, *et al.* EPPI-Reviewer: advanced software for systematic reviews, maps and evidence synthesis. Version: 6.16. London: EPPI Centre, UCL Social Research Institute, University College London 2025. <https://eppi.ioe.ac.uk/eppireviewer-web/home>
- 82 Hamel C, Hersi M, Kelly SE, *et al.* Guidance for using artificial intelligence for title and abstract screening while conducting knowledge syntheses. *BMC Med Res Methodol* 2021;**21**:285. doi: <https://doi.org/10.1186/s12874-021-01451-2>
- 83 Waffenschmidt S, Sieben W, Jakubeit T, *et al.* Increasing the efficiency of study selection for systematic reviews using prioritization tools and a single-screening approach. *Syst Rev* 2023;**12**:161. doi: <https://doi.org/10.1186/s13643-023-02334-x>
- 84 EPPI Centre. Machine learning in EPPI-Reviewer v_10.1 web version. London: EPPI Centre, UCL Social Research Institute, University College London n.d. https://eppi.ioe.ac.uk/cms/Portals/35/Manuals/Machine%20learning%20in%20EPPI-Reviewer%20v_10.1%20web%20version.pdf (accessed 18 May 2026).

- 85 Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;**372**:n71. doi: <https://doi.org/10.1136/bmj.n71>
- 86 Shea BJ, Reeves BC, Wells G, *et al.* AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ* 2017;**358**:j4008. doi: <https://doi.org/10.1136/bmj.j4008>
- 87 Lambe K, Teahan Á, Lee C, *et al.* The efficacy and safety of medicinal cannabis in adult populations: An evidence review. Dublin: Health Research Board 2024. [https://www.hrb.ie/publication/the-
efficacy-and-safety-of-medicinal-cannabis-in-adult-populations-an-evidence-review/](https://www.hrb.ie/publication/the-efficacy-and-safety-of-medicinal-cannabis-in-adult-populations-an-evidence-review/)
- 88 Guyatt GH, Oxman AD, Vist GE, *et al.* GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;**336**:924–6. doi: <https://doi.org/10.1136/bmj.39489.470347.AD>
- 89 Al Duhailib Z, Granholm A, Alhazzani W, *et al.* GRADE pearls and pitfalls — Part 1: Systematic reviews and meta-analyses. *Acta Anaesthesiol Scand* 2024;**68**:584–92. doi: <https://doi.org/10.1111/aas.14386>
- 90 Pollock A, Farmer SE, Brady MC, *et al.* An algorithm was developed to assign GRADE levels of evidence to comparisons within systematic reviews. *J Clin Epidemiol* 2016;**70**:106–10. doi: <https://doi.org/10.1016/j.jclinepi.2015.08.013>
- 91 Lunny C, Brennan SE, McDonald S, *et al.* Toward a comprehensive evidence map of overview of systematic review methods: paper 2-risk of bias assessment; synthesis, presentation and summary of the findings; and assessment of the certainty of the evidence. *Syst Rev* 2018;**7**:159. doi: <https://doi.org/10.1186/s13643-018-0784-8>
- 92 Atkins L, Francis J, Islam R, *et al.* A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci IS* 2017;**12**:77. doi: <https://doi.org/10.1186/s13012-017-0605-9>
- 93 Michie S, Johnston M, Abraham C, *et al.* Making psychological theory useful for implementing evidence based practice: a consensus approach. *BMJ Qual Saf* 2005;**14**:26–33. doi: <https://doi.org/10.1136/qshc.2004.011155>
- 94 Koulouvari A-D, Margariti A, Sakellari E, *et al.* Applications of behavioral change theories and models in health promotion interventions: a rapid review. *Behav Sci* 2025;**15**:580. doi: <https://doi.org/10.3390/bs15050580>
- 95 Abuhaloob L, MacGillivray S, Mossey P, *et al.* Maternal and child oral health interventions in Middle East and North Africa regions: a rapid review. *Int Dent J* 2019;**69**:409–18. doi: <https://doi.org/10.1111/idj.12506>
- 96 Carriconde Colvara B, Faustino-Silva DD, Meyer E, *et al.* Motivational interviewing for preventing early childhood caries: A systematic review and meta-analysis. *Community Dent Oral Epidemiol* 2021;**49**:10–6. doi: <https://doi.org/10.1111/cdoe.12578>
- 97 Faghihian R, Faghihian E, Kazemi A, *et al.* Impact of motivational interviewing on early childhood caries: A systematic review and meta-analysis. *J Am Dent Assoc* 2020;**151**:650–9. doi: <https://doi.org/10.1016/j.adaj.2020.06.003>
- 98 Gomersall JC, Slack-Smith L, Kilpatrick N, *et al.* Interventions with pregnant women, new mothers and other primary caregivers for preventing early childhood caries. *Cochrane Database Syst Rev* 2024;:Art. No.: CD012155 v3. doi: <https://doi.org/10.1002/14651858.CD012155.pub3>

- 99 Karande PH, Shetty VB, Vinay V, *et al.* Comparative evaluation of oral health and behavior changes in children after motivational interviewing and traditional method of oral health education among mothers: a systematic review and meta-analysis. *Int J Clin Pediatr Dent* 2023;**16**:464–73. doi: <https://doi.org/10.5005/jp-journals-10005-2594>
- 100 Saxena V, Datla A, Deheriya M, *et al.* Maternal oral health education for predicting early childhood caries among preschool children: a systematic review and meta-analysis. *J Clin Diagn Res* 2024;**18**:ZC42–8. doi: <https://doi.org/10.7860/JCDR/2024/69304.19423>
- 101 von Helde, Natália Magno, Martins ML, da Costa Motta, Mayara, *et al.* Are educational tools in oral health programs for pregnant women effective in improving the oral status of mothers and babies? A systematic review. *Evid Based Dent* 2024;**25**:216. doi: <https://doi.org/10.1038/s41432-024-01043-1>
- 102 Atif M, Tewari N, Saji S, *et al.* Effectiveness of various methods of educating children and adolescents for the maintenance of oral health: A systematic review of randomized controlled trials. *Int J Paediatr Dent* 2024;**34**:229–45. doi: <https://doi.org/10.1111/ipd.13125>
- 103 Dadipoor S, Akbarizadeh F, Ghaffari M, *et al.* Educational intervention of improve student’s oral health: a systematic review and meta-analysis school-based. *Iran J Public Health* 2023;**52**:500–14. doi: <https://doi.org/10.18502/ijph.v52i3.12133>
- 104 Gurav KM, Shetty V, Vinay V, *et al.* Effectiveness of oral health educational methods among school children aged 5-16 years in improving their oral health status: a meta-analysis. *Int J Clin Pediatr Dent* 2022;**15**:338–49. <https://www.ijcpd.com/doi/pdf/10.5005/jp-journals-10005-2395>
- 105 He IL, Liu P, Wong M C. M, *et al.* Effectiveness of psychological intervention in improving adolescents’ oral health: A systematic review and meta-analysis. *J Dent* 2024;**150**:105365. doi: <https://doi.org/10.1016/j.jdent.2024.105365>
- 106 Kim S, Kim SY. Effectiveness of school-based oral health education for children and adolescents in low- and middle-income countries: a systematic review and meta-analysis. *Asia Pac J Public Health* 2024;**36**:312–21. doi: <https://doi.org/10.1177/10105395241240959>
- 107 Nazari A, Hajhashemi M, Safavi SR, *et al.* Health promotion theory-based educational interventions for improving oral health in children and adolescents: a systematic review and meta-analysis. *BMC Oral Health* 2025;**25**:Art. 1153. doi: <https://doi.org/10.1186/s12903-025-06549-3>
- 108 Priya G, Asokan S, Janani RG, *et al.* Effectiveness of school dental health education on the oral health status and knowledge of children: A systematic review. *Indian J Dent Res Off Publ Indian Soc Dent Res* 2019;**30**:437–49. doi: https://doi.org/10.4103/ijdr.IJDR_805_18
- 109 Shakir A, Barnkgkei I, Godson J, *et al.* Effectiveness of school-based behavioural interventions to improve children’s oral health by reducing sugar intake and promoting oral hygiene: A rapid review of randomised controlled trials. *Community Dent Health* 2021;**38**:275–83. doi: https://doi.org/10.1922/CDH_00014Shakir09
- 110 Stein C, Santos NML, Hilgert JB, *et al.* Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis. *Community Dent Oral Epidemiol* 2018;**46**:30–7. doi: <https://doi.org/10.1111/cdoe.12325>
- 111 Tsai C, Raphael S, Agnew C, *et al.* Health promotion interventions to improve oral health of adolescents: A systematic review and meta-analysis. *Community Dent Oral Epidemiol* 2020;**48**:549–60. doi: <https://doi.org/10.1111/cdoe.12567>

- 112 Xiang B, Wong Hai Ming, Perfecto Antonio P, *et al.* The application of theory-guided oral health interventions in adolescents: a systematic review and meta-analysis of randomized controlled trials. *Psychol Health* 2021;**36**:879–94. doi: <https://doi.org/10.1080/08870446.2020.1801679>
- 113 Xiang B, Wong H M, Perfecto A P, *et al.* The effectiveness of behavioral interventions to improve oral health in adolescents at different periods of follow-up: A systematic review and meta-analysis. *Patient Educ Couns* 2020;**103**:725–33. doi: <https://doi.org/10.1016/j.pec.2019.11.030>
- 114 Albrecht M, Kupfer R, Reissmann DR, *et al.* Oral health educational interventions for nursing home staff and residents. *Cochrane Database Syst Rev* 2016;:Art. No.: CD010535. doi: <https://doi.org/10.1002/14651858.CD010535.pub2>
- 115 Mehta N, Das D, Dogra E, *et al.* Effectiveness of educating caregivers on oral health of institutionalized older adults: a systematic review and meta-analysis. *Int J Older People Nurs* 2025;**20**:e70038. doi: <https://doi.org/10.1111/opn.70038>
- 116 Salazar J, Andersen C, Øzhayat EB. Effect of oral health interventions for dependent older people-A systematic review. *Gerodontology* 2024;**41**:200–19. doi: <https://doi.org/10.1111/ger.12720>
- 117 European Federation of Periodontology. Oral health throughout life. 2025. <https://www.efp.org/for-patients/gum-disease-general-health/oral-health-throughout-life/> (accessed 16 Feb 2026).
- 118 European Federation of Periodontology. Oral health throughout life. Adulthood 20/59 years. 2025. https://www.efp.org/fileadmin/uploads/efp/Campaigns/Oral_Health_Throughout_Life/OHTL_FS_03ADULTS_AAFF_01ENG.pdf (accessed 16 Feb 2026).
- 119 FDI World Dental Federation. Oral health at work: a roadmap for prevention, productivity and workforce well-being. Geneva, Switzerland: FDI World Dental Federation 2026. <https://fdiworlddental.org/oral-health-work-roadmap-prevention-productivity-and-workforce-well-being> (accessed 2 June 2026).
- 120 Rollnick S, Miller WR, Butler CC. *Motivational interviewing in health care, second edition: helping patients change behavior*. New York, NY: Guilford Press 2023.
- 121 Soares RC, da Rosa SV, Moysés ST, *et al.* Methods for prevention of early childhood caries: Overview of systematic reviews. *Int J Paediatr Dent* 2021;**31**:394–421. doi: <https://doi.org/10.1111/ipd.12766>
- 122 Rana K, Ekanayake K, Chimoriya R, *et al.* Effectiveness of oral health promotion interventions: an evidence check rapid review brokered by the Sax Institute and commissioned by Dental Health Services Victoria for the Victorian Department of Health. Australia: The Sax Institute 2022. doi: <https://doi.org/10.57022/oik8302>
- 123 World Health Organization. WHO information series on school health. Geneva, Switzerland: World Health Organization 2003. <https://iris.who.int/server/api/core/bitstreams/90b40b89-a2e5-48f2-9453-91f492648853/content>
- 124 Poudel P, Paudel G, Acharya R, *et al.* Oral health and healthy ageing: a scoping review. *BMC Geriatr* 2024;**24**:Article 33. doi: <https://doi.org/10.1186/s12877-023-04613-7>
- 125 Hoffmann TC, Glasziou PP, Boutron I, *et al.* Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 2014;**348**:g1687. <https://doi.org/10.1136/bmj.g1687>

- 126 Kennedy C. National Oral Health Policy Academic Reference Group theoretical framework 2014. Dublin, Ireland: Government of Ireland 2014. <https://assets.gov.ie/static/documents/oral-health-policy-theoretical-framework.pdf>

Appendix A Preferred reporting items for overviews of reviews of health-care interventions (PRIOR)

PRIOR checklist

Section and Topic	Item #	Checklist Item	Location where item is reported
TITLE			
Title	1	Identify the report as an overview of reviews.	Title
ABSTRACT			
	2	Provide a comprehensive and accurate summary of the purpose, methods, and results of the overview of reviews.	Executive summary
INTRODUCTION			
Rationale	3	Describe the rationale for conducting the overview of reviews in the context of existing knowledge.	Section 1.3 Policy context Section 2.1 Research design
Objectives	4	Provide an explicit statement of the objective(s) or question(s) addressed by the overview of reviews.	Section 1.4 Research question
METHODS			
Eligibility criteria	5a	Specify the inclusion and exclusion criteria for the overview of reviews. If supplemental primary studies were included, this should be stated, with a rationale.	Section 2.3 Eligibility criteria
	5b	Specify the definition of 'systematic review' as used in the inclusion criteria for the overview of reviews.	Section 2.3 Eligibility criteria
Information sources	6	Specify all databases, registers, websites, organizations, reference lists, and other sources searched or consulted to identify systematic reviews and supplemental primary studies (if included). Specify the date when each source was last searched or consulted.	Section 2.4 Search methods and Appendix B Search strategies
Search strategy	7	Present the full search strategies for all databases, registers and websites, such that they could be reproduced. Describe any search filters and limits applied.	Section 2.4 Search methods and Appendix B Search strategies
Selection process	8a	Describe the methods used to decide whether a systematic review or supplemental primary study (if included) met the inclusion criteria of the overview of reviews.	Section 2.5 Study selection
	8b	Describe how overlap in the populations, interventions, comparators, and/or outcomes of systematic reviews was identified and managed during study selection.	Section 2.5 Study selection
Data collection process	9a	Describe the methods used to collect data from reports.	Section 2.6 Data extraction and

Section and Topic	Item #	Checklist Item	Location where item is reported
			Appendix D JBI extraction forms
	9b	If applicable, describe the methods used to identify and manage primary study overlap at the level of the comparison and outcome during data collection. For each outcome, specify the method used to illustrate and/or quantify the degree of primary study overlap across systematic reviews.	N/A
	9c	If applicable, specify the methods used to manage discrepant data across systematic reviews during data collection.	N/A
Data items	10	List and define all variables and outcomes for which data were sought. Describe any assumptions made and/or measures taken to identify and clarify missing or unclear information.	Section 2.6.1 Variables
Risk of bias assessment	11a	Describe the methods used to assess risk of bias or methodological quality of the included systematic reviews.	Section 2.6.2 Methodological quality assessment
	11b	Describe the methods used to collect data on (from the systematic reviews) and/or assess the risk of bias of the primary studies included in the systematic reviews. Provide a justification for instances where flawed, incomplete, or missing assessments are identified but not re-assessed.	Section 2.7.2 Presenting outcome data
	11c	Describe the methods used to assess the risk of bias of supplemental primary studies (if included).	N/A
Synthesis methods	12a	Describe the methods used to summarize or synthesize results and provide a rationale for the choice(s).	Section 2.7.3 Best evidence synthesis
	12b	Describe any methods used to explore possible causes of heterogeneity among results.	N/A
	12c	Describe any sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting bias assessment	13	Describe the methods used to collect data on (from the systematic reviews) and/or assess the risk of bias due to missing results in a summary or synthesis (arising from reporting biases at the levels of the systematic reviews, primary studies, and supplemental primary studies, if included).	Section 2.6.2 Methodological quality assessment
Certainty assessment	14	Describe the methods used to collect data on (from the systematic reviews) and/or assess certainty (or confidence) in the body of evidence for an outcome.	Section 2.7.3 Best evidence synthesis
RESULTS			
Systematic review and supplemental primary study selection	15a	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Section 3 Findings Sections 3.3.3, 3.4.3, 3.5.3
	15b	Provide a list of studies that might appear to meet the inclusion criteria, but were excluded, with the main reason for exclusion.	Appendix C
Characteristics of systematic reviews and	16	Cite each included systematic review and supplemental primary study (if included) and present its characteristics.	Section 3 Findings Sections 3.3.1, 3.4.1, and 3.5.1 Appendix F

Section and Topic	Item #	Checklist Item	Location where item is reported
supplemental primary studies			Summary characteristics of included systematic reviews
Primary study overlap	17	Describe the extent of primary study overlap across the included systematic reviews.	Section 3 Findings Sections 3.3.4, 3.4.4, and 3.5.4
Risk of bias in systematic reviews, primary studies, and supplemental primary studies	18a	Present assessments of risk of bias or methodological quality for each included systematic review.	Section 3 Findings Sections 3.3.2, 3.4.2, and 3.5.2
	18b	Present assessments (collected from systematic reviews or assessed anew) of the risk of bias of the primary studies included in the systematic reviews.	Appendix G GRADE summaries
	18c	Present assessments of the risk of bias of supplemental primary studies (if included).	N/A
Summary or synthesis of results	19a	For all outcomes, summarize the evidence from the systematic reviews and supplemental primary studies (if included). If meta-analyses were done, present for each the summary estimate and its precision and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Section 3 Findings Sections 3.3.5, 3.4.5, and 3.5.5
	19b	If meta-analyses were done, present results of all investigations of possible causes of heterogeneity.	
	19c	If meta-analyses were done, present results of all sensitivity analyses conducted to assess the robustness of synthesized results.	N/A
Reporting biases	20	Present assessments (collected from systematic reviews and/or assessed anew) of the risk of bias due to missing primary studies, analyses, or results in a summary or synthesis (arising from reporting biases at the levels of the systematic reviews, primary studies, and supplemental primary studies, if included) for each summary or synthesis assessed.	Included in GRADE assessments Appendix G GRADE summaries
Certainty of evidence	21	Present assessments (collected or assessed anew) of certainty (or confidence) in the body of evidence for each outcome.	Section 3 Findings Tables 11-15
DISCUSSION			
Discussion	22a	Summarize the main findings, including any discrepancies in findings across the included systematic reviews and supplemental primary studies (if included).	Section 4 Discussion
	22b	Provide a general interpretation of the results in the context of other evidence.	Section 4.1 Key findings

Section and Topic	Item #	Checklist Item	Location where item is reported
	22c	Discuss any limitations of the evidence from systematic reviews, their primary studies, and supplemental primary studies (if included) included in the overview of reviews. Discuss any limitations of the overview of reviews methods used.	Section 4.2 Strengths and limitations
	22d	Discuss implications for practice, policy, and future research (both systematic reviews and primary research). Consider the relevance of the findings to the end users of the overview of reviews, e.g., healthcare providers, policymakers, patients, among others.	Section 4.4 Policy implications
OTHER INFORMATION			
Registration and protocol	23a	Provide registration information for the overview of reviews, including register name and registration number, or state that the overview of reviews was not registered.	PROSPERO CRD420251173490
	23b	Indicate where the overview of reviews protocol can be accessed, or state that a protocol was not prepared.	
	23c	Describe and explain any amendments to information provided at registration or in the protocol. Indicate the stage of the overview of reviews at which amendments were made.	Section 2.8 Deviations from the published protocol This work is undertaken by the Health Research Board Evidence Centre, which is funded by the Department of Health, Ireland. The department has no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the
Support	24	Describe sources of financial or non-financial support for the overview of reviews, and the role of the funders or sponsors in the overview of reviews.	

Section and Topic	Item #	Checklist Item	Location where item is reported
			manuscript for publication
Competing interests	25	Declare any competing interests of the overview of reviews' authors.	None
Author information	26a	Provide contact information for the corresponding author.	phall@hrb.ie
	26b	Describe the contributions of individual authors and identify the guarantor of the overview of reviews.	
Availability of data and other materials	27	Report which of the following are available, where they can be found, and under which conditions they may be accessed: template data collection forms; data collected from included systematic reviews and supplemental primary studies; analytic code; any other materials used in the overview of reviews.	Appendices

Source: Gates *et al.* (2020) [46]

Appendix B Search strategies

Search results table

Type of search platform/search	Name of search platform	Search date	Results
Review-related search resources			
	Agency for Healthcare Quality and Research Systematic Review Data Repository (AHRQ SRDR)	15 Aug 2025	4
	Campbell Systematic Reviews by the Campbell Collaboration	15 Aug 2025	36
	Cochrane Database of Systematic Reviews (CSDR)	15 Aug 2025	39
	Epistemonikos	18 Aug 2025	1,300
	EPPI Centre Database of promoting health effectiveness reviews (DoPHER)	15 Aug 2025	219
	Health Evidence	15 Aug 2025	267
	International Network of Agencies for Health Technology Assessment Database (INAHTA)	15 Aug 2025	53
	Joanna Briggs Institute (JBI) Evidence Synthesis	15 Aug 2025	57
	PROSPERO	18 Aug 2025	283
Bibliographic databases and resources (clinical/psychological/sociological/international)			
	Biblioteca Regional de Medicina: BIREME Virtual Health Library (VHL) platform	18 Aug 2025	765
	EBSCO CINAHL	15 Aug 2025	777
	EBSCO MEDLINE	15 Aug 2025	3,903
	EBSCO SocINDEX	15 Aug 2025	21
	OVID APA PsycInfo	18 Aug 2025	89
	Scientific Electronic Library Online: SciELO	18 Aug 2025	22
Primary search results			
	Before deduplication		7,835
	After deduplication (number to screen)		5,350
Supplemental search results			
	Forward citation searching of included papers from primary searches and screening	12 Nov 2025	495
	Backward citation searching of included papers from primary searches and screening	12 Nov 2025	1,318
	Follow-up of protocols identified during primary results screening	17 Nov 2025	42
	Follow-up of identified umbrella review references	2 Dec 2025	240
	Preprint resource: MedRxiv/BioRxiv	2 Dec 2025	8
	Preprint resource: Open Science Framework: OSF.io	2 Dec 2025	11
	Preprint resource: Research Square	2 Dec 2025	0

Type of search platform/search	Name of search platform	Search date	Results
	Search engine: Bielefeld Academic Search Engine (BASE)	1 Dec 2025	2,074
	Search engine: DuckDuckGo	1 Dec 2025	66
	Search engine: Google Scholar	2 Dec 2025	1,130
	Search resource: Grey Matters	2 Dec 2025	0
	EBSCO MEDLINE	1 Dec 2025	358
	Epistemonikos	2 Dec 2025	308
Supplemental searches: Total	Before deduplication		6,050
	After deduplication (number to screen)		3,382

Primary searches

Agency for Healthcare Quality and Research Systematic Review Data Repository (AHRQ SRDR)

Search resource: Agency for Healthcare Quality and Research Systematic Review Data Repository (AHRQ SRDR)

Search platform/URL: <https://srdplus.ahrq.gov/searches#panel-general-search>

Search date: 15 Aug 2025

	Search terms	Projects (reviews)	Of which were oral health reviews
1.	Oral	39	4
2.	Dental	39	4
3.	Teeth/Tooth	58	4

Verified from manual check of AHRQ evidence syntheses.

Campbell Systematic Reviews by the Campbell Collaboration

Search resource: Campbell Systematic Reviews

Search platform/URL: <https://onlinelibrary.wiley.com/journal/18911803>

Publisher: Campbell Collaboration

Search date: 15 Aug 2025

Search limits: Publication dates: 2015-2025

Search line	Search terms	Search results
1.	Anywhere: "oral health" OR "dental health"	4
2.	Title: "oral OR dental OR dentist* OR dentition OR tooth OR teeth OR Mouth OR caries OR carious OR toothbrush*"	7
3.	Keywords "oral OR dental OR dentist* OR dentition OR tooth OR teeth OR Mouth OR caries OR carious OR toothbrush*"	2
4.	Abstract: "oral OR dental OR dentist* OR dentition OR tooth OR teeth OR Mouth OR caries OR carious OR toothbrush*"	20
5.	Title: "health promotion"	0
6.	Keywords: "health promotion"	0
7.	Abstract ""health promotion""	3
	Total	36

Cochrane Library

Search resource: Cochrane Database of Systematic Reviews (CDSR) and CENTRAL (only CDSR results were extracted for this review).

Search platform/URL: <https://www.cochranelibrary.com/advanced-search>

Search date: 15 Aug 2025

Search line	Search terms	Search results
#1	MeSH descriptor: [Dental Care] explode all trees	901

Search line	Search terms	Search results
#2	MeSH descriptor: [Dentistry] explode all trees	25,001
#3	MeSH descriptor: [Dental Health Services] explode all trees	940
#4	MeSH descriptor: [Specialties, Dental] explode all trees	746
#5	MeSH descriptor: [Dental Service, Hospital] explode all trees	16
#6	MeSH descriptor: [Dental Health Surveys] explode all trees	3,959
#7	MeSH descriptor: [Diagnosis, Oral] explode all trees	902
#8	MeSH descriptor: [Health Education, Dental] explode all trees	354
#9	MeSH descriptor: [Dental Facilities] explode all trees	101
#10	MeSH descriptor: [Dental Staff] explode all trees	290
#11	MeSH descriptor: [Comprehensive Dental Care] explode all trees	10
#12	MeSH descriptor: [Oral Health] explode all trees	850
#13	MeSH descriptor: [Oral Hygiene] explode all trees	2,852
#14	MeSH descriptor: [Dentition] explode all trees	10,884
#15	MeSH descriptor: [Tooth Diseases] explode all trees	15,680
#16	MeSH descriptor: [Mouth Diseases] explode all trees	17,279
#17	MeSH descriptor: [Dental Caries] explode all trees	3,885
#18	MeSH descriptor: [Gingival Diseases] explode all trees	3,583
#19	MeSH descriptor: [Dentifrices] explode all trees	1,924
#20	MeSH descriptor: [Mouthwashes] explode all trees	2,117
#21	MeSH descriptor: [Cariostatic Agents] explode all trees	2,705
#22	#1 OR #2 OR #3 OR #4 OR #5 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21	41,680
#23	(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene"):ti,ab,kw	71,142
#24	(Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR ORHQOL):ti,ab,kw	12,655
#25	(Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gel"):ti,ab,kw ("Tandlæge" OR zubni OR hortic OR "牙科" OR "hammaslääketieteellinen" OR dentaire OR zahnmedizinisch OR "οδοντιατρικός" OR "चिकित्सकीय" OR "fogászati" OR "tannlækningar" OR "齒科" OR tannlege OR "dentystyczny" OR stomatologic OR zobozdravstveni OR zubné OR "diş" OR "стоматологічний"):ti,ab,kw	12,780
#26	("fogászati" OR "tannlækningar" OR "齒科" OR tannlege OR "dentystyczny" OR stomatologic OR zobozdravstveni OR zubné OR "diş" OR "стоматологічний"):ti,ab,kw	1,271
#27	(" שיניים " OR " دندانی پزشکی " OR " طب الأسنان "):ti,ab,kw	0
#28	#22 OR #23 OR #24 OR #25 OR #26 OR #27	83,125
#29	MeSH descriptor: [Health Promotion] explode all trees	9,194
#30	MeSH descriptor: [Health Education] explode all trees	26,595
#31	MeSH descriptor: [Health Education, Dental] explode all trees	354
#32	MeSH descriptor: [Public Health] explode all trees and with qualifier(s): [education - ED]	120
#33	MeSH descriptor: [Preventive Medicine] explode all trees and with qualifier(s): [education - ED]	26
#34	MeSH descriptor: [Oral Health] explode all trees and with qualifier(s): [education - ED]	54
#35	MeSH descriptor: [Government Programs] explode all trees	605
#36	MeSH descriptor: [Patient Education as Topic] explode all trees	11,068
#37	MeSH descriptor: [Behavior Therapy] explode all trees	25,924
#38	MeSH descriptor: [Behavioral Medicine] explode all trees	52
#39	MeSH descriptor: [Counseling] explode all trees	7,562

Search line	Search terms	Search results
#40	MeSH descriptor: [Health Knowledge, Attitudes, Practice] explode all trees	8,578
#41	MeSH descriptor: [Teaching Materials] explode all trees	5,440
#42	MeSH descriptor: [Teaching] explode all trees	6,224
#43	MeSH descriptor: [Gamification] explode all trees	30
#44	MeSH descriptor: [Educational Personnel] explode all trees	889
#45	MeSH descriptor: [Correspondence as Topic] explode all trees	2,364
#46	MeSH descriptor: [Pamphlets] explode all trees	1,050
#47	MeSH descriptor: [Virtual Reality] explode all trees	1,515
#48	MeSH descriptor: [Mobile Applications] explode all trees	2,523
#49	MeSH descriptor: [Video Games] explode all trees	1,343
#50	("health promotion" OR "health-promoting" OR "health promotional" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "educational programme" OR "teaching program" OR "teaching programme" OR "training program" OR "training programme" OR "training campaign" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "educational campaign" OR "teaching campaign" OR "learning campaign" OR "learning program" OR "learning programme" OR "education intervention" OR "educational intervention" OR "promotional intervention"):ti,ab,kw	58,337
#51	((Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) NEAR/5 ("dental health" OR "oral health" OR dental OR dentist*)):ti,ab,kw	619
#52	((Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) NEAR/5 (dental OR dentist* OR oral)):ti,ab,kw	2,809
#53	((health OR education* OR instruction* OR teaching) NEAR/1 (campaign* OR program* OR fair OR fairs)):ti,ab,kw	18,319
#54	((Education* OR teaching OR instruction* OR learn*) NEAR/2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)):ti,ab,kw	18,332
#55	((video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")):ti,ab,kw	52,490
#56	((Behavior* OR Behaviour*) NEAR/2 (Change* OR modification OR modify OR modified)):ti,ab,kw	17,145
#57	#29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56	165,579
#58	#28 AND #57	5,479
		Of which, 37 reviews and 2 protocols. Only the reviews and protocols were exported

Epistemonikos

Search resource: Epistemonikos, by the Epistemonikos Foundation

Search platform/URL: https://www.epistemonikos.org/en/advanced_search

Search date: 15 Aug 2025

Note: Important: Advanced search only supports English

Search limits: Limited to results from previous 10 years, limited to systematic reviews using the 'Systematic Reviews' search facet.

Search 1	Search terms	Search results
1.	<p>(title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels"))</p>	129,263
2.	<p>(title:(("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy")) OR abstract:(("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy"))))</p>	84,059
3.	<p>(title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care"</p>	2,424

Search 1	Search terms	Search results
	OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy") OR abstract:("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy"))	
4. Date limit	2015-2025	1,631
Search 1: Total	Systematic reviews	304

Search 2	Search terms	Search results
1.	(title:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR	383,355

Search 1	Search terms	Search results
2.	<p>counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification") OR abstract:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification"))</p> <p>(title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification") OR abstract:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification"))</p>	6,636
3. Date limit	2015-2025	4,716
Search 2: Total	Systematic reviews	792

Search 3	Search terms	Search results
1.	Title:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile	91,226

2.	health" OR mHealth OR gamified OR gamification OR "computer-assisted") OR abstract:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile health" OR mHealth OR gamified OR gamification OR "computer-assisted") (title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile health" OR mHealth OR gamified OR gamification OR "computer-assisted") OR abstract:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile health" OR mHealth OR gamified OR gamification OR "computer-assisted"))	2331
3. Date limit	2015-2025	1,809
Search 3: Total	Systematic review	204

EPPI Centre Database of promoting health effectiveness reviews (DoPHER)

Search resource: DoPHER (EPPI Centre Database of promoting health effectiveness reviews (DoPHER))

Search platform/URL: <https://eppi.ioe.ac.uk/webdatabases4/SearchIntro.aspx>

Search date: 15 Aug 2025

Note: Free text (keyword) search

Search line	Search terms	Search results
1.	Freetext (All but Authors): dental	173
2.	Freetext (All but Authors): oral	264
3.	Freetext (All but Authors): dentist	12

Search line	Search terms	Search results
4.	Freetext (All but Authors): dentition	8
5.	Freetext (All but Authors): teeth	28
6.	Freetext (All but Authors): tooth	31
7.	Freetext (All but Authors): mouth	16
8.	Freetext (All but Authors): caries	112
9.	Freetext (All but Authors): toothbrush*	1
10.	Freetext (All but Authors): mouthcare	0
11.	2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11	324
12.	Freetext (Year): 2015-2025	6275
13.	11 AND 12	219

Health Evidence

Search resource: McMaster University Health Evidence

Search platform/URL: <https://www.healthevidence.org/search.aspx>

Search date: 15 Aug 2025

Intervention Strategy: Advocacy; Behavior Modification; Education, Awareness & Skill Development or Training

Results are limited to 50 articles per search and may not be used for commercial purposes. For this reason, searches were split to allow for extraction with results under 50 items

Search line	Search terms	Search results
1.	Date = Published from 2015 to 2018 Topic Area = Oral Health & Hygiene	31
2.	Date = Published from 2019 to 2019 Topic Area = Oral Health & Hygiene	21
3.	Date = Published from 2020 to 2020 Topic Area = Oral Health & Hygiene	35
4.	Date = Published from 2021 to 2022 Topic Area = Oral Health & Hygiene	39
5.	Date = Published from 2023 to 2025 Topic Area = Oral Health & Hygiene	46
6.	[("oral health" OR "dental Health" OR "dental hygiene" OR "oral care" OR "dental care" OR "toothbrushing") AND (education OR educational OR training OR teaching OR literacy OR "health promotion")] AND Limit: Date = Published from 2015 to 2018	24
7.	[("oral health" OR "dental Health" OR "dental hygiene" OR "oral care" OR "dental care" OR "toothbrushing") AND (education OR educational OR training OR teaching OR literacy OR "health promotion")] AND Limit: Date = Published from 2019 to 2021	30
8.	[("oral health" OR "dental Health" OR "dental hygiene" OR "oral care" OR "dental care" OR "toothbrushing") AND (education OR educational OR training OR teaching OR literacy OR "health promotion")] AND Limit: Date = Published from 2022 to 2025	41
	Total	267

International Network of Agencies for Health Technology Assessment Database

Search resource: International Network of Agencies for Health Technology Assessment (INAHTA) Database

Search platform/URL: <https://database.inahta.org/>

Search date: 15 Aug 2025

	Search terms	Search results
1.	("oral health" OR "dental Health" OR "dental hygiene" OR "oral care" OR "dental care" OR "toothbrushing") FROM 2015 TO 2025	17
2.	(dentist OR "dental hygienist" OR "dental nurse" OR dentition OR "dental staff") FROM 2015 TO 2025	4
3.	(caries OR Cariostatic OR cariogenic OR DMFT OR DMF OR toothbrush OR toothbrushing) FROM 2015 TO 2025	14
4.	(dental OR oral OR dentist OR dentition)[abs] AND (education OR educational OR literacy OR teaching or Training OR "Health promotion")[abs] FROM 2015 TO 2025	18
	Total	53

Joanna Briggs Institute (JBI) Evidence Synthesis

Search resource: Joanna Briggs Institute (JBI) Evidence Synthesis

Search platform/URL: <https://journals.lww.com/jbisrir/pages/advancedsearch.aspx>

Search date: 15 Aug 2025

Search line	Search terms	Search results
1.	"oral health" OR "dental Health" OR "dental hygiene" OR "oral care" OR "dental care" OR "toothbrushing" [Brief report, Review article, Research article]	49
2.	dentist OR "dental hygienist" OR "dental nurse" OR dentition OR "dental staff"; education OR educational OR literacy OR teaching or Training OR "Health promotion"	3
3.	"oral health promotion"	1
4.	"oral health education"	4
5.	"dental health literacy"	0
6.	Abstract: "dental health"; "health literacy"	0

Joanna Briggs Systematic Review register: https://jbi.global/systematic-review-register?combine=&items_per_page=All

Note: No in-scope items found from manual check of register 2024-5

PROSPERO

Search resource: PROSPERO systematic review registry

Search platform/URL: Centre for Reviews and Dissemination (CRD) and National Institute for Health and Care Research (NIHR) <https://www.crd.york.ac.uk/PROSPERO/search>

Search date: 15 Aug 2025

Search line	Search results	Search results
1.	Search term: MeSH DESCRIPTOR Health Education, Dental	39
2.	("oral health"):KW AND MeSH DESCRIPTOR Health Promotion	34
3.	("dental health"):KW AND MeSH DESCRIPTOR Health Promotion	4
4.	("oral health"):KW AND MeSH DESCRIPTOR Education	0

Search line	Search results	Search results
5.	("dental health"):KW AND MeSH DESCRIPTOR Education	0
6.	("dental health"):KW AND ("education"):KW	16
7.	("oral health"):KW AND ("education"):KW	59
8.	("oral health"):KW AND ("promotion"):KW	46
9.	("dental health"):KW AND ("promotion"):KW	10
10.	("dental"):KW AND ("health literacy"):KW	8
11.	("oral"):KW AND ("health literacy"):KW	19
12.	("dental"):KW AND ("educational"):KW	18
13.	("caries"):KW AND ("education"):KW	15
14.	("toothbrushing"):KW AND ("education"):KW	4
	<u>total</u>	283

Bibliographic databases and resources (clinical/ psychological/ sociological/ international)

Biblioteca Regional de Medicina: BIREME Virtual Health Library platform

Search resource: Biblioteca Regional de Medicina: BIREME Virtual Health Library (VHL) Regional Portal

Search platform/URL: <https://pesquisa.bvsalud.org/porta/advanced/?lang=en>

Search date: 18 Aug 2025

Search limits: keyword search only, no search filter. Search limited to results from previous 10 years

Search line	Search terms	Search results
1.	<p>Search: title, abstract, subjects Past 10 years ("dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR dentition) AND (((("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy"))) AND ("systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review")</p>	<p>Lilacs Plus Collection: 46 Complete collection of the VHL: 348</p>
2.	<p>Search: title, abstract, subjects Past 10 years ("dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental</p>	<p>Lilacs Plus Collection: 41</p>

Search line	Search terms	Search results
	hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR dentition) AND ("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR "health fair" OR "health fairs" OR counselling OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification" OR "educational material" OR "teaching material" OR "teaching website") AND ("systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review")	Complete collection of the VHL: 278
3.	("salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé bucco-dentaire" OR Mundgesundheits OR munnhelse OR mundhygiejne OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid OR "salute orale") AND (("promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselibas veicināšana" OR "sveikatos stiprinimas" OR "健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eğitimi" OR "教育干預" OR "教育干預" OR "教育的介入" OR "pædagogisk intervention" OR "educatieve interventie" OR "hariduslik sekkumine" OR "koulutusinterventio" OR "intervention educative" OR "pädagogische Intervention" OR "εκπαιδευτική παρέμβαση" OR "oktatási beavatkozás" OR "intervensi Pendidikan" OR "intervento educativo" OR "edukacinè intervencija" OR "wawaotanga matauranga" OR "pedagogisk intervensjon" OR "intervenção educacional" OR "intervenção educative" OR "eadar-theachd foghlaim" OR "izobraževalna intervencija" OR "intervención educative" OR "eğitim müdahalesi")) AND ("revisão sistemática" OR "revisión sistemática" OR "revue systématique" OR "systematische Überprüfung" OR "revisión sistemática rehegua" OR "systematische review" OR "sistematizado uñakipaña" OR "revisione sistematica" OR "systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review")	Lilacs Plus Collection: 31 Complete collection of the VHL: 139

EBSCO CINAHL

Search resource: CINAHL

Search platform/URL: EBSCO

Search date: 15 Aug 2025

Search limit: Canadian Drug Agency's Systematic reviews, Meta-analyses, Health technology assessments, Indirect treatment comparisons search filter

Search line	Search terms	Search results
S1	(MH "Dentistry+") OR (MH "Dental Care+") OR (MH "Public Health Dentistry") OR (MH "Dental Health Services+") OR (MH "Preventive Dentistry") OR (MH "Education, Dental Hygiene") OR (MH "Dental Health Education")	117,770
S2	(MH "Oral Health") OR (MH "Oral Health (Omaha)") OR (MH "Oral Health (Iowa NOC)") OR (MH "Oral Health Maintenance (Iowa NIC)") OR (MH "Oral Health Restoration (Iowa NIC)") OR (MH "Oral Medicine") OR (MH "Oral Hygiene") OR (MH "Self-Care: Oral Hygiene (Iowa NOC)") OR (MH "Oral Health Promotion (Iowa NIC)") OR (MH "Pathology, Oral") OR (MH "Surgery, Oral") OR (MH "Diagnosis, Oral+")	36,666
S3	(MH "Dental Care Team") OR (MH "Students, Dental") OR (MH "Research, Dental") OR (MH "Specialties, Dental+") OR (MH "Dental Auxiliaries+") OR (MH "Dental Hygienist Attitudes") OR (MH "Community Dental Health Coordinators") OR (MH "Schools, Dental") OR (MH "Faculty, Dental") OR (MH "Dental Organizations") OR (MH "Staff Development Instructors") OR (MH "Dental Hygiene Assessment") OR (MH "Evidence-Based Dental Practice")	41,652
S4	(MH "Dentition+") OR (MH "Tooth Diseases+") OR (MH "Mouth Diseases+") OR (MH "Mouth Care (Saba CCC)") OR (MH "Mouth Care") OR (MH "Gingival Diseases+") OR (MH "Dental Hygiene") OR (MH "Dental Caries") OR (MH "Dental Floss") OR (MH "Toothbrushes") OR (MH "Dental Amalgam") OR (MH "Dentifrices") OR (MH "Cariostatic Agents") OR (MH "Fluorides, Topical")	127,283
S5	(TI (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (AB (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (SU (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene"))	207,492
S6	(TI (Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (AB (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (MW (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (SU (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score"))	20,729
S7	(TI OHRQoL) OR (AB OHRQoL) OR (SU OHRQoL)	1,123
S8	(TX (Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels"))	11,006
S9	(TI ("Tandlæge" OR zubni OR hartz OR "牙科" OR "hammaslääketieteellinen" OR dentaire OR Zahnmedizinisch OR "οδοντιατρικός" OR "चिकित्सकीय" OR "fogászati" OR "tannlækningar" OR "齒科" OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR "zubné" OR "diş" OR "стоматологічний")) OR (AB ("Tandlæge" OR zubni OR hartz OR "牙科" OR "hammaslääketieteellinen" OR dentaire OR Zahnmedizinisch OR "οδοντιατρικός" OR "चिकित्सकीय" OR "fogászati" OR "tannlækningar" OR "齒科" OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR "zubné" OR "diş" OR "стоматологічний"))	577
S10	(SU ("Tandlæge" OR zubni OR hartz OR "牙科" OR "hammaslääketieteellinen" OR dentaire OR Zahnmedizinisch OR "οδοντιατρικός" OR "चिकित्सकीय" OR "fogászati"	0

Search line	Search terms	Search results
	OR "tannlækningar" OR " 歯科" OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR "zubné" OR "diş" OR "стоматологічний"))	
S11	(TX (طب الأسنان (TX (دندانپزشکی OR שיניים))	690
S12	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11	259,575
S13	(MH "Health Promotion+") OR (MH "Royal Society for the Promotion of Health") OR (MH "Pender Health Promotion Model") OR (MH "Health Promotion (Saba CCC)") OR (MH "Oral Health Promotion (Iowa NIC)") OR (MH "Health Promoting Behavior (Iowa NOC)") OR (MH "Health Literacy") OR (MH "Health Educators") OR (MH "Health Education+") OR (MH "Health Fairs") OR (MH "School Health Education") OR (MH "Patient Education+") OR (MH "Plain Language Summaries") OR (MH "Dental Health Education")	234,023
S14	(MH "Health Education+") OR (MH "Dental Health Education") OR (MH "Public Health/ED") OR (MH "Public Health Nursing/ED") OR (MH "Public Health Dentistry") OR (MH "European Association for Dental Public Health") OR (MH "Preventive Health Care+/ED") OR (MH "Occupational Health/ED") OR (MH "Community Health Services+/ED")	235,221
S15	(MH "Oral Health/ED") OR (MH "Oral Hygiene/ED") OR (MH "Oral Medicine/ED")	1,495
S16	(MH "Health Behavior+/ED") OR (MH "Behavior Modification") OR (MH "Behavior Therapy") OR (MH "Counseling") OR (MH "Nutritional Counseling") OR (MH "Counseling (Iowa NIC)") OR (MH "Teaching, Guidance, and Counseling (Omaha)") OR (MH "Counseling Service (Saba CCC)")	56,410
S17	(MH "Teaching+") OR (MH "Teaching Materials+") OR (MH "Teaching: Preoperative (Iowa NIC)") OR (MH "Teaching: Individual (Iowa NIC)") OR (MH "Teaching: Group (Iowa NIC)") OR (MH "Teaching, Guidance, and Counseling (Omaha)") OR (MH "Teaching: Prescribed Diet (Iowa NIC)") OR (MH "Teaching Methods, Clinical") OR (MH "Teaching Materials, Clinical") OR (MH "Teaching Methods+") OR (MH "Teaching: Infant Care (Iowa NIC)") OR (MH "Patient Education") OR (MH "Models, Educational")	348,003
S18	(TI (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((AB (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((SU (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((MW (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*))	2,153
S19	(TI (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (AB (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (SU (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral))	14,740
S20	(TI (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (AB (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (SU (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs))	135,237
S21	(TI (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (AB (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (SU (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification))	75,150

Search line	Search terms	Search results
S22	(TI (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (AB (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR app-based" OR "mobile health" OR mHealth OR "educational material")) OR (MW (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (SU (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material"))	90,117
S23	(TI ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (AB ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (SU ((Behavio#r*) N2 (Change* OR modification OR modify OR modified)))	42,642
S24	(TI ("קידום בריאות" OR "געזונטהייט העבערונג" OR "ارتقاء سلامت" OR "تعزیز الصحة")) OR (AB ("קידום בריאות" OR "געזונטהייט העבערונג" OR "ارتقاء سلامت" OR "تعزیز الصحة"))	75
S25	(TI ("健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselības veicināšana" OR "sveikatos stiprinimas" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eğitimi")) OR (AB ("健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselības veicināšana" OR "sveikatos stiprinimas" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eğitimi"))	2,738
S26	(TI ("בילדונגס- " OR "התערבות חינוכית" OR "مدخله آموزشی" OR "التدخل التعليمي")) OR (AB ("בילדונגס- " OR "התערבות חינוכית" OR "مدخله آموزشی" OR "التدخل التعليمي"))	16
S27	(TX ("教育干預" OR "教育干预" OR "教育的介入" OR "pædagogisk intervention" OR "educatieve interventie" OR "hariduslik sekkumine" OR "koulutusinterventio" OR "intervention educative" OR "pädagogische Intervention" OR "εκπαιδευτική παρέμβαση" OR "oktatási beavatkozás" OR "intervensi Pendidikan" OR "intervento educativo" OR "edukacinè intervencija" OR "wawaotanga matauranga" OR "pedagogisk intervensjon" OR "intervenção educacional" OR "intervenção educative" OR "eadar-theachd foghlaim" OR "izobraževalna intervencija" OR "intervención educative" OR "eğitim müdahalesi"))	134
S28	S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27	760,534
S29	S12 AND S28	30,346
S30	(MH "meta analysis" OR MH "systematic review" OR MH "Technology, Medical/EV" OR PT "systematic review" OR PT "meta analysis" OR (((TI systematic* OR AB systematic*) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*))) OR ((TI methodologic* OR AB methodologic*) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*)))) OR (((TI quantitative OR AB quantitative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*) OR (TI syntheses* OR AB	376,287

Search line	Search terms	Search results
	synthes*))) OR ((TI research OR AB research) N3 ((TI integrati* OR AB integrati*) OR (TI overview* OR AB overview*))) OR (((TI integrative OR AB integrative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*)) OR ((TI collaborative OR AB collaborative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*)) OR ((TI pool* OR AB pool*) N3 (TI analy* OR AB analy*)) OR ((TI "data synthes*" OR AB "data synthes*") OR (TI "data extraction*" OR AB "data extraction*") OR (TI "data abstraction*" OR AB "data abstraction*")) OR ((TI handsearch* OR AB handsearch*) OR (TI "hand search*" OR AB "hand search*")) OR ((TI "mantel haenszel" OR AB "mantel haenszel") OR (TI peto OR AB peto) OR (TI "der simonian" OR AB "der simonian") OR (TI dersimonian OR AB dersimonian) OR (TI "fixed effect*" OR AB "fixed effect*") OR (TI "latin square*" OR AB "latin square*")) OR ((TI "met analy*" OR AB "met analy*") OR (TI metanaly* OR AB metanaly*) OR (TI "technology assessment*" OR AB "technology assessment*") OR (TI HTA OR AB HTA) OR (TI HTAs OR AB HTAs) OR (TI "technology overview*" OR AB "technology overview*") OR (TI "technology appraisal*" OR AB "technology appraisal*")) OR ((TI "meta regression*" OR AB "meta regression*") OR (TI metaregression* OR AB metaregression*)) OR (TI meta-analy* OR TI metaanaly* OR TI "systematic review*" OR TI "biomedical technology assessment*" OR TI "bio-medical technology assessment*" OR AB meta-analy* OR AB metaanaly* OR AB "systematic review*" OR AB "biomedical technology assessment*" OR AB "bio-medical technology assessment*" OR MW meta-analy* OR MW metaanaly* OR MW "systematic review*" OR MW "biomedical technology assessment*" OR MW "bio-medical technology assessment*") OR ((TI medline OR AB medline OR MW medline) OR (TI cochrane OR AB cochrane OR MW cochrane) OR (TI pubmed OR AB pubmed OR MW pubmed) OR (TI medlars OR AB medlars OR MW medlars) OR (TI embase OR AB embase OR MW embase) OR (TI cinahl OR AB cinahl OR MW cinahl)) OR (SO Cochrane OR SO health technology assessment OR SO evidence report) OR ((TI comparative OR AB comparative) N3 ((TI efficacy OR AB efficacy) OR (TI effectiveness OR AB effectiveness))) OR ((TI "outcomes research" OR AB "outcomes research") OR (TI "relative effectiveness" OR AB "relative effectiveness")) OR (((TI indirect OR AB indirect) OR (TI "indirect treatment" OR AB "indirect treatment")) OR (TI mixed-treatment OR AB mixed-treatment) OR (TI bayesian OR AB bayesian)) N3 (TI comparison* OR AB comparison*) OR ((TI multi* OR AB multi*) N3 (TI treatment OR AB treatment) N3 (TI comparison* OR AB comparison*)) OR ((TI mixed OR AB mixed) N3 (TI treatment OR AB treatment) N3 ((TI meta-analy* OR AB meta-analy*) OR (TI metaanaly* OR AB metaanaly*))) OR (TI "umbrella review*" OR AB "umbrella review*") OR ((TI multi* OR AB multi*) N2 (TI paramet* OR AB paramet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis)) OR ((TI multiparamet* OR AB multiparamet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis)) OR ((TI multi-paramet* OR AB multi-paramet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis))	
S31	S29 AND S30	1,080
S32	S31 Limiters - Publication Date: 20150101-20251231	777

EBSCO MEDLINE

Search resource: MEDLINE

Search platform/URL: EBSCO

Search date: 15 Aug 2025

Search limit: Canadian Health Librarians Association Literature reviews and meta-analysis search filter

Search line	Search terms	Search results
S1	(MH "Dental Care+") OR (MH "Dentistry+") OR (MH "Preventive Dentistry+") OR (MH "Dental Health Services+") OR (MH "Public Health Dentistry+") OR (MH "School dentistry") OR (MH "Dental Service, Hospital) OR (MH "Dental Health Surveys") OR (MH "Diagnosis, Oral") OR (MH "Health Education, Dental+") OR (MH "Dental Facilities+") OR (MH "Dental staff+") OR (MH "Comprehensive Dental Care")	458,844
S2	(MH "Oral Health") OR (MH "Oral Hygiene+")	41,321
S3	((MH "Dentition+") OR (MH "Tooth Diseases") OR (MH "Mouth Diseases+") OR (MH "Dental Caries") OR (MH "Gingival Diseases+"))	545,087
S4	(TI (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (AB (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (SU (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene"))	844,118
S5	(TI (Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (AB (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (MW (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (SU (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score"))	92,446
S6	(TI OHRQoL) OR (AB OHRQoL) OR (SU OHRQoL)	2,724
S7	(MH "Dentifrices+") OR (MH "Mouthwashes") OR ("MH "Cariostatic materials+")	13,078
S8	(TX (Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels"))	35,713
S9	(TI (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR שיניים OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (AB (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR שיניים OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (SU (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR שיניים OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний))	1,173
S10	طب الأسنان TX	51
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	1,112,755
S12	(MH "Health promotion+")	90,133
S13	(MH "Health education+") OR (MH "Health education, dental")	274,564

Search line	Search terms	Search results
S14	(MH "Public health/ED+") OR (MH "Preventive Medicine+/ED") OR (MH "Oral Health/ED+) OR (MH "Government Programs")	125,924
S15	(MH "Patient education as topic")	90,996
S16	(MH "Behavior Therapy+") OR (MH "Behavioral Medicine+) OR (MH "Counseling+") OR (MH "Health Knowledge, Attitudes, Practice") OR (MH "Teaching materials+") OR (MH "Teaching+") OR "MH "Gamification")	98,544
S17	(TI ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (AB ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (SU ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (MW ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*"))	365,762
S18	(TI (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((AB (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((SU (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((MW (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*))	4,726
S19	(TI (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (AB (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (SU (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral))	41,327
S20	(MH "Educational personnel+")	46,378
S21	(TI (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (AB (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (SU (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs))	158,622
S22	(TI (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (AB (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (SU (Education* OR teaching OR instruction* OR	132,867

Search line	Search terms	Search results
S23	learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) (MH "Correspondance as Topic+") OR (MH "Pamphlets") OR (MH "Virtual reality") OR (MH "Mobile applications") OR (MH "Video Games") OR ((TI (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (AB (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR app-based" OR "mobile health" OR mHealth OR "educational material")) OR (MW (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (SU (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material"))	334,180
S24	(TI ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (AB ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (SU ((Behavio#r*) N2 (Change* OR modification OR modify OR modified)))	104,702
S25	(TX ("קידום בריאות" OR "געזונטהייט העבערונג" OR "رتقای سلامت" OR "تعزیز الصحة"))	37
S26	(TX ("健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselības veicināšana" OR "sveikatos stiprinimas" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eğitimi"))	4,573
S27	(TX ("בילדונגס- התערבות חינוכית" OR "مداخله آموزشی" OR "التدخل التعليمي" OR "אינטערװענץ אינטערװענץ"))	4
S28	(TX ("教育干預" OR "教育干預" OR "教育的介入" OR "pædagogisk intervention" OR "educatieve interventie" OR "hariduslik sekkumine" OR "koulutusinterventio" OR "intervention educative" OR "pädagogische Intervention" OR "εκπαιδευτική παρέμβαση" OR "oktatási beavatkozás" OR "intervensi Pendidikan" OR "intervento educativo" OR "edukacinė intervencija" OR "wawaotanga matauranga" OR "pedagogisk intervensjon" OR "intervenção educacional" OR "intervenção educative" OR "eadar-theachd foghlaim" OR "izobraževalna intervencija" OR "intervención educative" OR "eğitim müdahalesi"))	62
S29	S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28	1,223,417
S30	S11 AND S29	79,101
S31	TI (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*) OR AB (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*) OR SU (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe*	3,942,796

Search line	Search terms	Search results
	OR meta-synthe*) OR MH ("Review Literature as Topic" OR "Review" OR "Meta-Analysis as Topic" OR "Meta-Analysis" OR "systematic review" OR "systematic review as Topic") OR PT ("Scoping review" OR "Network Meta-Analysis" OR Review OR "Systematic review" or Meta-analysis)	
S32	S30 AND S31	6,620
S33	S32 Limiters - Publication Date: 20150101-20251231	3,903

EBSCO SocINDEX

Search resource: SocINDEX

Search platform/URL: EBSCO

Search date: 15 Aug 2025

Search limits: Search filter adapted from CDA-AMC's EBSCO CINAHL filter but with search field codes specific to CINAHL removed

Search line	Search terms	Search results
S1	DE "PREVENTIVE dentistry" OR DE "ORAL habits" OR DE "DENTAL care"	990
S2	(TI (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (AB (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (SU (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene"))	5,440
S3	(TI (Caries OR carious OR karies* OR "cariës" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (AB (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (SU (Caries OR carious OR karies* OR "cariës" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score"))	833
S4	(TI OHRQoL) OR (AB OHRQoL) OR (SU OHRQoL)	23
S5	(TX (Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels"))	227
S6	(TI (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR चिकित्सकीय OR fogászati OR tannlækningar OR 歯科 OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (AB (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR चिकित्सकीय OR fogászati OR tannlækningar OR 歯科 OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (SU (Tandlæge OR zubni OR hartz OR 牙科 OR hammaslääketieteellinen OR dentaire OR	110

Search line	Search terms	Search results
	zahnmedizinisch OR οδοντιατρικός OR चिकित्सकीय OR fogászati OR tannlækningar OR 歯科 OR tannlege OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний))	
S7	(TX (طب الأسنان) OR دندانپزشکی OR שיניים))	0
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	6,143
S9	DE "HEALTH promotion" OR DE "HEALTH promotion -- Social aspects" OR DE "PUBLIC health communication" OR DE "HEALTH literacy" OR DE "HEALTH education"	13,989
S10	DE "EDUCATION" OR DE "EDUCATION policy" OR DE "EDUCATION research" OR DE "WORK & education" OR DE "EDUCATION costs" OR DE "EDUCATIONAL change" OR DE "EDUCATIONAL cooperation" OR DE "EDUCATIONAL counseling" OR DE "EDUCATIONAL equalization" OR DE "EDUCATIONAL exchanges" OR DE "EDUCATIONAL finance" OR DE "EDUCATIONAL ideologies" OR DE "EDUCATION & society" OR DE "EDUCATIONAL innovations" OR DE "EDUCATIONAL intervention" OR DE "EDUCATIONAL law & legislation" OR DE "EDUCATIONAL productivity" OR DE "EDUCATIONAL standards" OR DE "EDUCATIONAL technology" OR DE "EDUCATIONAL tests & measurements" OR DE "EDUCATIONAL vouchers" OR DE "EDUCATORS" OR DE "EFFECT of education on economic development" OR DE "CAREER education" OR DE "CONTINUING education" OR DE "VOCATIONAL education" OR DE "EDUCATION & politics"	103,831
S11	DE "PSYCHOTHERAPY" OR DE "MOTIVATIONAL interviewing" OR DE "BEHAVIOR modification" OR DE "APPLIED behavior analysis" OR DE "BEHAVIOR modification for problem children" OR DE "BEHAVIOR therapy" OR DE "MOTIVATIONAL interviewing" OR DE "BEHAVIOR therapy" OR DE "COGNITIVE therapy"	24,491
S12	DE "TRAINING" OR DE "OCCUPATIONAL training" OR DE "TEACHING" OR DE "PEER teaching" OR DE "TEACHER attitudes" OR DE "TEACHER evaluation" OR DE "TEACHER-student communication" OR DE "TEACHERS" OR DE "TEACHERS & community" OR DE "TEACHING & society" OR DE "TEACHING methods" OR DE "CASE method (Teaching)"	41,970
S13	DE "STUDENT engagement" OR DE "STUDENT evaluation of teachers" OR DE "STUDENT exchange programs" OR DE "STUDENT health" OR DE "STUDENTS" OR DE "GRADING of students" OR DE "GRADUATE students" OR DE "GRADUATES" OR DE "LEARNING" OR DE "LEARNING communities" OR DE "CLASSROOM environment" OR DE "PARENT-teacher relationships" OR DE "CLASSROOMS"	34,410
S14	DE "TELECOMMUNICATION" OR DE "COMPUTER assisted research" OR DE "GAMES" OR DE "COMPUTER assisted instruction" OR DE "COMPUTER literacy" OR DE "ELECTRONIC information resources" OR DE "HUMAN-computer interaction" OR DE "INFORMATION technology" OR DE "VIDEO games" OR DE "TELEPHONE calls" OR DE "SOCIAL media mobile apps" OR DE "SOCIAL media research" OR DE "CELL phones" OR DE "TELEPHONES"	14,067
S15	(TI ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*") OR (AB ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (SU ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy	38,761

Search line	Search terms	Search results
S16	campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*") (TI (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((AB (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((SU (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((MW (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*))	96
S17	(TI (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (AB (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (SU (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral))	703
S18	(TI (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (AB (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (SU (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs))	30,413
S19	(TI (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (AB (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (SU (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification))	33,807
S20	(TI (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (AB (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR app-based" OR "mobile health" OR mHealth OR "educational material")) OR (SU (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material"))	38,335
S21	(TI ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (AB ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (SU ((Behavio#r*) N2 (Change* OR modification OR modify OR modified)))	13,535
S22	(TX ("קידום בריאות" OR "געזונטהייט העכערונג" OR "ارتقای سلامت" OR "تعزیز الصحة"))	3
S23	(TX ("健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselibas veicināšana" OR "sveikatos stiprinimas" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eğitimi"))	415
S24	(TX ("التدخل التعليمي" OR "مداخله آموزشی" OR "התערבות חינוכית" OR "בילדונגס- אינטערווענץ"))	0

Search line	Search terms	Search results
S25	(TX (“教育干預” OR “教育干預” OR “教育的介入“ OR “pædagogisk intervention” OR “educatieve interventie” OR “hariduslik sekkumine” OR “koulutusinterventio” OR “intervention educative” OR “pädagogische Intervention” OR “εκπαιδευτική παρέμβαση” OR “oktatási beavatkozás” OR “intervensi Pendidikan” OR “intervento educativo” OR “edukacinè intervencija” OR “wawaotanga matauranga” OR “pedagogisk intervensjon” OR “intervenção educacional” OR “intervenção educative” OR “eadar-theachd foghlaim” OR “izobraževalna intervencija” OR “intervención educative” OR “eğitim müdahalesi”))	17
S26	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25	282,292
S27	S8 AND S22	996
	(((TI systematic* OR AB systematic*) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*))) OR ((TI methodologic* OR AB methodologic*) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*))) OR (((TI quantitative OR AB quantitative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*) OR (TI synthes* OR AB synthes*))) OR ((TI research OR AB research) N3 ((TI integrati* OR AB integrati*) OR (TI overview* OR AB overview*))) OR (((TI integrative OR AB integrative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*))) OR ((TI collaborative OR AB collaborative) N3 ((TI review* OR AB review*) OR (TI overview* OR AB overview*))) OR ((TI pool* OR AB pool*) N3 (TI analy* OR AB analy*)) OR ((TI "data synthes*" OR AB "data synthes*") OR (TI "data extraction*" OR AB "data extraction*") OR (TI "data abstraction*" OR AB "data abstraction*")) OR ((TI handsearch* OR AB handsearch*) OR (TI "hand search*" OR AB "hand search*")) OR ((TI "mantel haenszel" OR AB "mantel haenszel") OR (TI peto OR AB peto) OR (TI "der simonian" OR AB "der simonian") OR (TI dersimonian OR AB dersimonian) OR (TI "fixed effect*" OR AB "fixed effect*") OR (TI "latin square*" OR AB "latin square*")) OR ((TI "met analy*" OR AB "met analy*") OR (TI metanaly* OR AB metanaly*) OR (TI "technology assessment*" OR AB "technology assessment*") OR (TI HTA OR AB HTA) OR (TI HTAs OR AB HTAs) OR (TI "technology overview*" OR AB "technology overview*") OR (TI "technology appraisal*" OR AB "technology appraisal*")) OR ((TI "meta regression*" OR AB "meta regression*") OR (TI metaregression* OR AB metaregression*)) OR (TI meta-analy* OR TI metaanaly* OR TI "systematic review*" OR TI "biomedical technology assessment*" OR TI "bio-medical technology assessment*" OR AB meta-analy* OR AB metaanaly* OR AB "systematic review*" OR AB "biomedical technology assessment*" OR AB "bio-medical technology assessment*" OR KW meta-analy* OR SU meta-analy* OR KW metaanaly* OR SU metaanaly* OR KW "systematic review*" OR SU "systematic review*" OR KW "biomedical technology assessment*" OR SU "biomedical technology assessment*" OR KW "bio-medical technology assessment*" OR SU "bio-medical technology assessment*") OR ((TI medline OR AB medline OR KW medline OR SU medline) OR (TI cochrane OR AB cochrane OR KW Cochrane OR SU Cochrane) OR (TI pubmed OR AB pubmed OR KW pubmed OR SU medline) OR (TI medlars OR AB medlars OR KW medlars OR SU medlars) OR (TI embase OR AB embase OR KW Embase OR SU embase) OR (TI cinahl OR AB cinahl OR KW cinahl OR SU cinahl)) OR (SO Cochrane OR SO health technology assessment OR SO evidence report) OR ((TI comparative OR AB comparative) N3 ((TI efficacy OR AB efficacy) OR (TI effectiveness OR AB effectiveness))) OR ((TI "outcomes research" OR AB "outcomes research") OR (TI "relative effectiveness" OR AB "relative effectiveness")) OR (((TI indirect OR AB indirect) OR (TI "indirect treatment" OR AB "indirect treatment") OR (TI mixed-treatment OR AB mixed-treatment) OR (TI bayesian OR AB bayesian)) N3 (TI comparison* OR AB comparison*)) OR ((TI multi* OR AB multi*) N3 (TI treatment OR AB treatment) N3 (TI comparison* OR	32,445

Search line	Search terms	Search results
	AB comparison*) OR ((TI mixed OR AB mixed) N3 (TI treatment OR AB treatment) N3 ((TI meta-analy* OR AB meta-analy*) OR (TI metaanaly* OR AB metaanaly*))) OR (TI "umbrella review*" OR AB "umbrella review*") OR ((TI multi* OR AB multi*) N2 (TI paramet* OR AB paramet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis)) OR ((TI multiparamet* OR AB multiparamet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis)) OR ((TI multi-paramet* OR AB multi-paramet*) N2 (TI evidence OR AB evidence) N2 (TI synthesis OR AB synthesis))	
S25	S23 AND S24	21

OID APA PsycInfo

Search resource: APA PsycInfo 1806 to August 2025 Week 2

Search platform/URL: Ovid

Search date: 18 Aug 2025

Search filter: CDA-AMC Ovid PsycInfo search filter for systematic reviews

Search line	Search terms	Search results
1.	exp Dental education/	276
2.	exp Oral Health/ or exp Dental Health/	2,363
3.	exp Dentistry/ or exp Dental Treatment/ or dental surgery/ or exp Dental Disorders/ or exp Dentists/ or Dental students/	3,268
4.	exp "Mouth (Anatomy)"/	3,561
5.	(Dental* or dentist* or dentit* or dentin* or odonto* or orthodont* or periodont* or endodont* or tooth* or teeth* or gingiv* or "oral health" or "oral-health" or "oral care" or "oral hygiene" or "mouth care" or mouthcare or "mouth health" or "mouth hygiene").mp.	13,989
6.	(Caries or carious or karies* or "cariës" or carie or DMFT or DMF or DMFS or "decayed, missing, filled" or "plaque score").mp.	986
7.	OHRQoL.mp.	153
8.	(Toothbrush* or "tooth brush" or "tooth brushes" or "tooth-brush" or "tooth-brushes" or "tooth-brushing" or "dental floss" or "dental devices" or toothpaste* or dentifric* or mouthrins* or "mouth-rinse" or mouthwash* or "interdental cleaning aids" or "plaque disclosing agents" or "denture cleaner" or "denture cleanser" or "denture fixative" or "saliva substitute" or "artificial saliva" or "fluoride gel" or "fluoride gels").mp.	684
9.	(zubni or hortz or dentaire or zahnmedizinisch or tannlege or dentystyczny or stomatologic or zobozdravstveni OR "santé bucco-dentaire" or Mundgesundheits or munnhelse or mundhygiejne OR "salud buccal" OR "salute orale" OR "salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid).mp.	44
10.	or/1-9	16,791
11.	exp Health Promotion/	31,304
12.	exp Health Literacy/ or exp Educational Psychology/ or health psychologists/ or health psychology assessment/ or exp Occupational Guidance/ or exp Counselor Education/ or exp Counselors/ or exp Client Centered Therapy/ or exp Psychotherapy/ or exp Counseling Psychology/ or exp Counseling/ or exp School Counseling/	326,445
13.	exp Student Teaching/ or exp Teaching Methods/ or exp Discovery Teaching Method/ or exp Teaching Machines/ or exp Teaching/ or exp Team Teaching	947,537

Search line	Search terms	Search results
14.	Method/ or exp learning/ or exp education/ or exp educational psychology/ or individualized instruction/ or learning environment/ or reinforcement/ teaching/ or exp course evaluation/ or formative assessment/ or exp instructional media/ or exp teacher effectiveness/ or teaching machines/ or teaching methods/ or team teaching method/ or public service announcements/ or advocacy/ or mass media/ or persuasive communication/ or public health campaigns/ or television advertising/	141,346
15.	(health promotion OR health-promoting OR promotion of health OR patient education OR education program* OR educational program* OR oral health literacy OR literacy campaign OR health campaign* OR education campaign* OR education intervention* OR Educational intervention* OR teaching program* OR teaching campaign* OR training program* OR training campaign* OR literacy promotion).mp.	175,406
16.	((Promotion OR promoting OR promoted OR campaign* OR literacy OR counsel* OR advoca*) adj5 ("dental health" OR "oral health" OR dental OR dentist*)).mp.	387
17.	((Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) adj5 (dental OR dentist* OR oral)).mp.	3,877
18.	((health OR education* OR instruction* OR teaching) adj1 (campaign* OR program* OR fair OR fairs)).mp.	96,737
19.	(video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material").mp.	131,359
20.	((Education* OR teaching OR instruction* OR learn*) adj2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)).mp.	130,248
21.	("promotion de la santé" or "Gesundheitsförderung" or "heilsufarsefling" or "promozione della salute" or "promosi Kesehatan" or "veselības veicināšana" or "sveikatos stiprinimas" or "promicanje zdravlja" or "sundhedsfremme" or "tervise edendamine" or "helsefremmende tiltak" or "promoção da saúde" or "promocija zdravja" or "promoción de la salud" or "hälsofrämjande" or "pædagogisk intervention" or "educatieve interventie" or "hariduslik sekkumine" or "koulutusinterventio" or "intervention educative" or "pädagogische Intervention" or "intervensi Pendidikan" or "intervento educativo" or "edukacinė intervencija" or "pedagogisk intervensjon" or "intervenção educacional" or "intervenção educative" or "izobraževalna intervencija" or "intervención educative").mp.	36
22.	Or/11-21	1,433,466
23.	10 and 22	3,869
24.	(systematic review or meta-analysis).mp.	91,672
25.	meta-analysis/ or systematic review/ or systematic reviews as topic/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/ or network meta-analysis/	932
26.	((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).mp.	72,990
27.	((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).mp.	13,163
28.	((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).mp.	7,886
29.	(data synthes* or data extraction* or data abstraction*).mp.	5,181
30.	(handsearch* or hand search*).mp.	1,825
31.	(mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).mp.	7,587
32.	(met analy* or metanaly* or technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).mp.	1,596

Search line	Search terms	Search results
33.	(meta regression* or metaregression*).mp.	3,486
34.	(meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.	103,528
35.	(medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.	46,928
36.	(cochrane or (health adj2 technology assessment) or evidence report).jw.	0
37.	(comparative adj3 (efficacy or effectiveness)).mp.	2,903
38.	(outcomes research or relative effectiveness).mp.	4,435
39.	((indirect or indirect treatment or mixed-treatment or bayesian) adj3 comparison*).mp.	628
40.	(meta-analysis or systematic review).md.	85,701
41.	(multi* adj3 treatment adj3 comparison*).mp.	62
42.	(mixed adj3 treatment adj3 (meta-analy* or metaanaly*)).mp.	19
43.	umbrella review*.mp.	528
44.	(multi* adj2 paramet* adj2 evidence adj2 synthesis).mp.	2
45.	(multiparamet* adj2 evidence adj2 synthesis).mp.	9
46.	(multi-paramet* adj2 evidence adj2 synthesis).mp.	2
47.	or/23-46	164,471
48.	23 and 47	143
49.	limit 48 to yr="2015 - 2027"	89

Scientific Electronic Library Online (SciELO)

Search resource: Scientific Electronic Library Online (SciELO)

Search platform/URL: <https://www.scielo.org/en/>

Search date: 18 Aug 2025

Limit: All indexes, results published between 2015 and 2025

Search line	Search terms	Search results
1.	"dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR "salud buccal" OR "salute orale" OR "salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé bucco-dentaire" OR Mundgesundheits OR munnhelse OR mundhygiejne OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid	8,504
2.	"health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy"	15,184
3.	"revisão sistemática" OR "revisión sistemática" OR "revue systématique" OR "systematische Überprüfung" OR "revisión sistemática rehegua" OR "systematische review" OR "sistematizado uñakipaña" OR "revisión"	18,054

Search line	Search terms	Search results
4. Search 1	<p>sistemática" OR "systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review"</p> <p>("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy") AND ("dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR "salud buccal" OR "salute orale" OR "salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé bucco-dentaire" OR Mundgesundheits OR munnhelse OR mundhygiejne OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid)) AND (("revisão sistemática" OR "revisión sistemática" OR "revue systématique" OR "systematische Überprüfung" OR "revisión sistemática rehegua" OR "systematische review" OR "sistematizado uñakipaña" OR "revisión sistemática" OR "systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review"))</p> <p>("promotion de la santé" OR "Gesundheitsförderung" OR "heilsufarsefning" OR "promozione della salute" OR "promosi Kesehatan" OR "veselības veicināšana" OR "sveikatos stiprinimas" OR "promocianje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "pædagogisk intervention" OR "educatieve interventie" OR "hariduslik sekkumine" OR "koulutusinterventio" OR "intervention educative" OR "pædagogische Intervention" OR "intervensi Pendidikan" OR "intervento educativo" OR "edukaciné intervencija" OR "pedagogisk intervensjon" OR "intervenção educacional" OR "intervenção educative" OR "izobraževalna intervencija" OR "intervención educative")</p> <p>("revisão sistemática" OR "revisión sistemática" OR "revue systématique" OR "systematische Überprüfung" OR "revisión sistemática rehegua" OR "systematische review" OR "sistematizado uñakipaña" OR "revisión sistemática" OR "systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review") AND ("dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR "salud buccal" OR "salute orale" OR "salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé bucco-dentaire" OR</p>	17 5624 226

Search line	Search terms	Search results
	Mundgesundheit OR munnhelse OR mundhygiejne OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid))	
Search 2	(("revisão sistemática" OR "revisión sistemática" OR "revue systématique" OR "systematische Überprüfung" OR "revisión sistemática rehegua" OR "systematische review" OR "sistemizado uñakipaña" OR "revisione sistematica" OR "systematic review" OR "metaanalysis" OR "meta-analysis" OR "HTA" OR "health technology assessment" OR "quantitative review" OR "qualitative review" OR "evidence synthesis" OR "evidence syntheses" OR "scoping review" OR "integrative review" OR "cochrane review") AND ("dental health" OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR toothbrushing OR caries OR dentist OR dentists OR "dental hygienist" OR "dental hygienists" OR "dental nurse" OR "dental nurses" OR "salud buccal" OR "salute orale" OR "salud buccal" OR "saúde buccal" OR "salud bucal" OR "salud dental" OR "santé bucco-dentaire" OR Mundgesundheit OR munnhelse OR mundhygiejne OR "santé dentaire" OR Zahngesundheit OR "salute dentale" OR "tandheelkundige gezondheid" OR mondgezondheid)) AND ("promotion de la santé" OR "Gesundheitsförderung" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "veselības veicināšana" OR "sveikatos stiprinimas" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "pædagogisk intervention" OR "educatieve interventie" OR "hariduslik sekkumine" OR "koulutusinterventio" OR "intervention educative" OR "pädagogische Intervention" OR "intervensi Pendidikan" OR "intervento educativo" OR "educacinè intervencija" OR "pedagogisk intervensjon" OR "intervenção educacional" OR "intervenção educative" OR "izobraževalna intervencija" OR "intervención educative") 2015-2025	5
	Total	22

Supplemental searches

Citation searching of included papers from primary searches and screening

Citation searching	Results
Forward citation searching of included papers from primary searches and screening	495
Backward citation searching of included papers from primary searches and screening	1,318
Follow-up of protocols identified in title and abstract screening	42
Follow-up of relevant umbrella reviews identified during primary searches (n=7)*	240

List of umbrella reviews included for citation chasing in supplemental searches:	
1.	Bhadauria US, Priya H, Purohit B, et al. Effectiveness of school oral health programs in children and adolescents: an umbrella review. Evid Based Dent 2024;25:211–211. doi:https://doi.org/10.1038/s41432-024-01013-7
2.	Csikar J, Edwebi S, Vinall-Collier K, et al. Oral health interventions and strategies delivered by care workers to older people living in care homes: an overview of systematic reviews. BMC Oral Health 2025;25:1574. doi:https://doi.org/10.1186/s12903-025-06943-x
3.	Das H, Janakiram C, S VK, et al. Effectiveness of school-based oral health education interventions on oral health status and oral hygiene behaviors among schoolchildren: an umbrella review. Evid Based Dent 2025;26:110–1. doi:https://doi.org/10.1038/s41432-024-01101-8

List of umbrella reviews included for citation chasing in supplemental searches:	
4.	Horta Maya, Ana. Motivational interviewing as a strategy to improve the oral health of children and caregivers. Umbrella review. <i>RPAP</i> 2024;26:e1–12. doi: https://doi.org/10.60147/2cb1e384
5.	Janakiram C, James A, Vattiprolu SV, et al. Supervised toothbrushing programs: evaluating impact, barriers, and facilitators - a mixed-method umbrella review. <i>Evid Based Dent Published Online First</i> : 2025. doi: https://doi.org/10.1038/s41432-025-01178-9
6.	Sanghavi B, Sachdev SS, Sachdev JB, et al. Social Media as a Tool for Oral Health Promotion: An Umbrella Review of Systematic Reviews and Content-Analysis Studies Across Digital Platforms. <i>Cureus</i> 2025;17:e87962. doi: https://doi.org/10.7759/cureus.87962
7.	Sardana D, Ritto FP, Ciesla D, et al. Evaluation of oral health education programs for oral health of individuals with visual impairment: An umbrella review. <i>Spec Care Dentist</i> 2023;43:751–64. doi: https://doi.org/10.1111/scd.12873

Note: One identified umbrella review (by Sohn *et al.* (2004)) was excluded from the citation-chasing process, as the references from this review would have been published before the cut-off inclusion date of our evidence review.

Grey Matters

Search resource: Grey Matters

Search platform/URL: <https://greymatters.cda-amc.ca/>

Publisher: Canada’s Drug Agency/L’Agence des médicaments du Canada (CDA-AMC)

Search date: 2 Dec 2025

Search line	Search terms	Search results
1.	Oral health promotion	0
2.	“oral health” “health promotion”	0
3.	“dental health” “health promotion”	0
4.	“dental health” “health education”	0
5.	“dentist” “health education”	0
6.	"oral health" "educational intervention"	0
7.	"dental health" "educational intervention"	0
8.	"dentist" "health promotion"	0

Search engine: Bielefeld Academic Search Engine (BASE)

Search resource: Bielefeld Academic Search Engine (BASE)

Search platform/URL: <https://www.base-search.net/Search/Advanced>

Search date: 1 Dec 2025

Limits: 2015-2025

Limits: Additional word forms

Content providers: Worldwide

Search mode: All fields

Advanced Search

All Fields "oral health promotion"

Title

Author

ORCID ID

Subject Headings

DOI

(Part of) URL

10 Hits per page Boost open access documents

Access

Open Access Non-Open Access Unknown

Document Type

All

Text

Book Conference object Patent

Book part Report Thesis

Journal/Newspaper Review Bachelor's thesis

Article contribution Course material Master's thesis

Other non-article Lecture Doctoral and postdoctoral thesis

Manuscript

Musical notation Image/Video Software

Map Still image Dataset

Audio Moving Image/Video Unknown

	Search terms	Results
1.	"oral health promotion" "systematic review" year:[2015 TO 2025]	221
2.	"oral health" "health promotion" "systematic review" year:[2015 TO 2025]	378
3.	"dentist" "health promotion" "systematic review" year:[2015 TO 2025]	50
4.	"dental" "health promotion" "systematic review" year:[2015 TO 2025]	293
5.	"oral health" "education" "systematic review" year:[2015 TO 2025]	1,012, of which 1,000 were extractable
6.	"dental" "patient education" "systematic review" year:[2015 TO 2025]	68
7.	"caries" "patient education" "systematic review" year:[2015 TO 2025]	9
8.	"dentist" "patient education" "systematic review" year:[2015 TO 2025]	16
9.	"dental" "literacy intervention" "systematic review" year:[2015 TO 2025]	1
10.	"oral health" "teaching" "systematic review" year:[2015 TO 2025]	106
	Total	2,074

Preprint resource: MedRxiv/BioRxiv

Search resource: MedRxiv/BioRxiv

Search platform/URL: <https://www.medrxiv.org/search>

Search date: 1 Dec 2025

Search limit: posted between "01 Jan, 2015 and 31 Dec, 2025"

Search line	Search terms	Results	Of which systematic reviews
1.	abstract or title "oral health promotion" (match phrase words)	10	1
2.	abstract or title "oral health education" (match phrase words)	10	1
3.	abstract or title "dental health promotion" (match all words)	60	1
4.	abstract or title "oral health promotion" (match all words)	76	2
5.	abstract or title ""health promotion" "oral health"" (match all words)	76	2
6.	abstract or title ""oral health" "educational intervention"" (match all words)	8	1
7.	abstract or title ""dental health" "educational intervention"" (match all words)	2	1
8.	abstract or title ""dentist" "educational intervention"" (match all words)	1	0

Preprint resource: Open Science Framework: OSF.io

Search resource: Open Science Framework OSF.io

Search platform/URL: <https://osf.io/search>

Search date: 2 Dec 2025

Search line	Search terms	Results
1.	"oral health promotion" "systematic review"	3; of which 2 individual projects
2.	"oral health" "health promotion" "systematic review"	4; of which 3 individual projects
3.	"dentist" "health promotion" "systematic review"	0
4.	"dental health" "health promotion" "systematic review"	0
5.	"dentist" "health education" "systematic review"	0
6.	"oral health" "health education" "systematic review"	5
7.	"oral health" "health education" "evidence synthesis"	1
8.	"dental health" "health education" "evidence synthesis"	0
9.	"dental health" "educational intervention" "systematic review"	0
10.	"dental health" "educational intervention" "evidence synthesis"	0
11.	"oral health" "educational intervention" "systematic review"	0
12.	"oral health" "educational intervention" "evidence synthesis"	0
	Total	11

Preprint resource: Research Square

Search resource: Research Square

Search platform/URL: <https://www.researchsquare.com/>

Search date: 2 Dec 2025

Article type: systematic review

Date limit: Published after 01 Jan 2015

First 100 results for each search examined. Relevant results downloaded

	Search terms		Results downloaded
1.	Abstract: oral health promotion	1 - 10 of 796 Preprints	0
2.	Title: oral health promotion	1 - 10 of 209 Preprints	0
3.	Abstract: "dental health" "Health promotion"	1 - 10 of 778 Preprints	0
4.	Title: "dental health" "Health promotion"	1 - 10 of 207 Preprints	0
5.	Title: "oral health" "educational intervention"	1 - 10 of 365 Preprints	0
6.	Abstract: "oral health" "educational intervention"	1 - 10 of 1,083 Preprints	0
7.	Abstract: dentist health promotion	1 - 10 of 768 Preprints	0
8.	Title: dentist health promotion	1 - 10 of 202 Preprints	0
	Total		0

Search engine: DuckDuckGo

Search resource:

Search platform/URL: <https://duckduckgo.com/>

Search date: 1 Dec 2025

Limits: Safe search: moderate

Limit: first ten pages examined for each search. Note: Only material relating to the search topic were captured – advertisements and general website content were not downloaded

Search line	Search terms	Downloaded to Zotero
1.	"oral health promotion" "systematic review"	22
2.	"oral health promotion" "evidence synthesis"	0
3.	"dental health" "health promotion" "systematic review"	1
4.	"dentist" "health promotion" "systematic review"	1
5.	"dentist" "health education" "systematic review"	0
6.	"oral health" "health education" "systematic review"	39
7.	"oral health" "health education" "evidence synthesis"	0
8.	"dental health" "health education" "evidence synthesis"	0
9.	"dental health" "educational intervention" "evidence synthesis"	0
10.	"dental health" "educational intervention" "systematic review"	0
11.	"oral health" "educational intervention" "systematic review"	1
12.	"oral health" "educational intervention" "evidence synthesis"	0
	Total	66

Search engine: Google Scholar

Search resource: Google Scholar

Search platform/URL: <https://scholar.google.com/>

Search date: 1 Dec 2025

Limits 2015-2025

Downloaded: first 100 results per search

Search line	Search terms	Search results	Downloaded to Zotero
1.	"oral health promotion" "systematic review"	About 9,700 results (0.17 sec)	100
2.	"oral health promotion" "evidence synthesis"	About 263 results (0.23 sec)	100
3.	"dental health" "health promotion" "systematic review"	About 15,300 results (0.26 sec)	100
4.	"dentist" "health promotion" "systematic review"	About 1,500 results (0.09 sec)	100
5.	"dentist" "health education" "systematic review"	About 1,700 results (0.11 sec)	100
6.	"oral health" "health education" "systematic review"	About 3,480 results (0.07 sec)	100
7.	"oral health" "health education" "evidence synthesis"	About 198 results (0.30 sec)	100

8.	"dental health" "health education" "evidence synthesis"	About 76 results (0.18 sec)	73
9.	"dental health" "educational intervention" "systematic review"	About 227 results (0.16 sec)	100
10.	"dental health" "educational intervention" "evidence synthesis"	About 57 results (0.20 sec)	57
11.	"oral health" "educational intervention" "systematic review"	About 3,660 results (0.47 sec)	100
12.	"oral health" "educational intervention" "evidence synthesis"	About 214 results (0.34 sec)	100
	Total		1,130

Final database searches

EBSCO MEDLINE

Search resource: MEDLINE

Search platform/URL: EBSCO

Search date: 01 Dec 2025

Limit: Jul 2025-Dec 2027 (limiting to publications available since the primary searches were carried out – the most recent publications captured were dated 2027, therefore the search limit of “Publication Date: 20250701-20271231” was used); Canadian Health Librarians Association Literature reviews and meta-analysis search filter.

Search line	Search terms	Search results
S1	(MH "Dental Care+") OR (MH "Dentistry+") OR (MH "Preventive Dentistry+") OR (MH "Dental Health Services+") OR (MH "Public Health Dentistry+") OR (MH "School dentistry") OR (MH "Dental Service, Hospital) OR (MH "Dental Health Surveys") OR (MH "Diagnosis, Oral") OR (MH "Health Education, Dental+") OR (MH "Dental Facilities+") OR (MH "Dental staff+") OR (MH "Comprehensive Dental Care")	462,088
S2	(MH "Oral Health") OR (MH "Oral Hygiene+")	41,857
S3	((MH "Dentition+") OR (MH "Tooth Diseases") OR (MH "Mouth Diseases+") OR (MH "Dental Caries") OR (MH "Gingival Diseases+"))	549,447
S4	(TI (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (AB (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene")) OR (SU (Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene"))	854,493
S5	(TI (Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (AB (Caries OR carious OR karies* OR "cariès" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (MW (Caries OR carious OR karies* OR "cariès" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score")) OR (SU (Caries OR carious OR karies* OR "cariès" OR carie OR DMF OR DMFT OR DMFS OR "decayed, missing, filled" OR "plaque score"))	93,795

Search line	Search terms	Search results
S6	(TI OHRQoL) OR (AB OHRQoL) OR (SU OHRQoL)	2,825
S7	(MH "Dentifrices+") OR (MH "Mouthwashes") OR ("MH "Cariostatic materials+")	13,163
S8	(TX (Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels"))	36,374
S9	(TI (Tandlæge OR zubni OR hortz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR דינטיש OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (AB (Tandlæge OR zubni OR hortz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR דינטיש OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний)) OR (SU (Tandlæge OR zubni OR hortz OR 牙科 OR hammaslääketieteellinen OR dentaire OR Zahnmedizinisch OR οδοντιατρικός OR דינטיש OR चिकित्सकीय OR fogászati OR tannlækningar OR 齒科 OR tannlege OR دندانپزشکی OR dentystyczny OR stomatologic OR zobozdravstveni OR zubné OR diş OR стоматологічний))	1,180
S10	TX طب الأسنان	51
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	1,125,350
S12	(MH "Health promotion+")	90,993
S13	(MH "Health education+") OR (MH "Health education, dental")	276,696
S14	(MH "Public health/ED+") OR (MH "Preventive Medicine+/ED") OR (MH "Oral Health/ED+") OR (MH "Government Programs")	127,241
S15	(MH "Patient education as topic")	91,542
S16	(MH "Behavior Therapy+") OR (MH "Behavioral Medicine+") OR (MH "Counseling+") OR (MH "Health Knowledge, Attitudes, Practice") OR (MH "Teaching materials+") OR (MH "Teaching+") OR "MH "Gamification")	100,028
S17	(TI ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (AB ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (SU ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*")) OR (MW ("health promotion" OR "health-promoting" OR "patient education" OR "education* program*" OR "teaching program*" OR "training program*" OR "training campaign*" OR "literacy promotion" OR "promotion of health" OR "oral health literacy" OR "literacy campaign" OR "health campaign" OR "education* campaign*" OR "teaching campaign*" OR "education* intervention*"))	372,626
S18	(TI (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*)) OR ((AB (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel*	4,871

Search line	Search terms	Search results
	OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*) OR ((SU (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR Advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*) OR ((MW (Promotion OR promoting OR promoted OR campaign* OR Literacy OR counsel* OR advocacy) N5 ("dental health" OR "oral health" OR dental OR dentist*))	
S19	(TI (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (AB (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral)) OR (SU (Education* OR educate* OR educator* OR teacher* OR teaching OR learner* OR learning OR trainer*) N5 (dental OR dentist* OR oral))	42,013
S20	(MH "Educational personnel+")	47,004
S21	(TI (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (AB (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs)) OR (SU (health OR education* OR instruction* OR teaching) N1 (campaign* OR program* OR fair OR fairs))	161,226
S22	(TI (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (AB (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification)) OR (SU (Education* OR teaching OR instruction* OR learn*) N2 (course* OR program* OR online OR website* OR webpage* OR virtual OR digital OR "computer-assisted" OR gamified OR gamification))	135,902
S23	(MH "Correspondance as Topic+") OR (MH "Pamphlets") OR (MH "Virtual reality") OR (MH "Mobile applications") OR (MH "Video Games") OR ((TI (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot* OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (AB (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR app-based OR "mobile health" OR mHealth OR "educational material")) OR (MW (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material")) OR (SU (video OR videos OR leaflet* OR brochure* OR pamphlet* OR lecture* OR "social media" OR chatbot OR "phone app" OR "app-based" OR "mobile health" OR mHealth OR "educational material"))	346,533
S24	(TI ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (AB ((Behavio#r*) N2 (Change* OR modification OR modify OR modified))) OR (SU ((Behavio#r*) N2 (Change* OR modification OR modify OR modified)))	106,823
S25	(TX ("קידום בריאות" OR "געזונטהייט העכערונג" OR "ارتقاء سلامت" OR "تعزيز الصحة"))	38
S26	(TX ("健康促進" OR "健康促进" OR "健康促進" OR "promicanje zdravlja" OR "sundhedsfremme" OR "tervise edendamine" OR "terveyden edistäminen" OR "promotion de la santé" OR "Gesundheitsförderung" OR "προαγωγή της υγείας" OR "स्वास्थ्य प्रचार" OR "heilsufarsefling" OR "promozione della salute" OR "promosi Kesehatan" OR "건강 증진" OR "veselibas veicināšana" OR "sveikatos stiprinimas" OR "whakatairanga Hauora" OR "helsefremmende tiltak" OR "promoção da saúde" OR "promovarea sănătății" OR "adhartachadh slàinte" OR "promocija zdravja" OR "promoción de la salud" OR "hälsofrämjande" OR "thúc đẩy sức khỏe" OR "sağlık eđitimi"))	4,706
S27	(TX ("בילדונגס-" OR "התערבות חינוכית" OR "مداخله آموزشی" OR "التدخل التعليمي" OR "אינטערעווענץ"))	4

Search line	Search terms	Search results
S28	(TX (“教育干預” OR “教育干预” OR “教育的介入” OR “pædagogisk intervention” OR “educatieve interventie” OR “hariduslik sekkumine” OR “koulutusinterventio” OR “intervention educative” OR “pädagogische Intervention” OR “εκπαιδευτική παρέμβαση” OR “oktatási beavatkozás” OR “intervensi Pendidikan” OR “intervento educativo” OR “edukacinè intervencija” OR “wawaotanga matauranga” OR “pedagogisk intervensjon” OR “intervenção educacional” OR “intervenção educative” OR “eadar-theachd foghlaim” OR “izobraževalna intervencija” OR “intervención educative” OR “eğitim müdahalesi”))	62
S29	S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28	1,248,925
S30	S11 AND S29	80,561
S31	TI (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*) OR AB (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*) OR SU (((systematic OR state-of-the-art OR scoping OR literature OR umbrella) W0 (review OR reviews OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) N1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*) OR MH ("Review Literature as Topic" OR "Review" OR "Meta-Analysis as Topic" OR "Meta-Analysis" OR "systematic review" OR "systematic review as Topic") OR PT ("Scoping review" OR "Network Meta-Analysis" OR Review OR "Systematic review" or Meta-analysis)	4,015,990
S32	S30 AND S31	6,850
S33	S30 AND S31 Limiters - Publication Date: 20250701-20271231	358

Epistemonikos

Search platform/URL: Epistemonikos Foundation https://www.epistemonikos.org/en/advanced_search

Search date: 2 Dec 2025

Date Limit: 2025-2025 (publications since the primary searches were carried out)

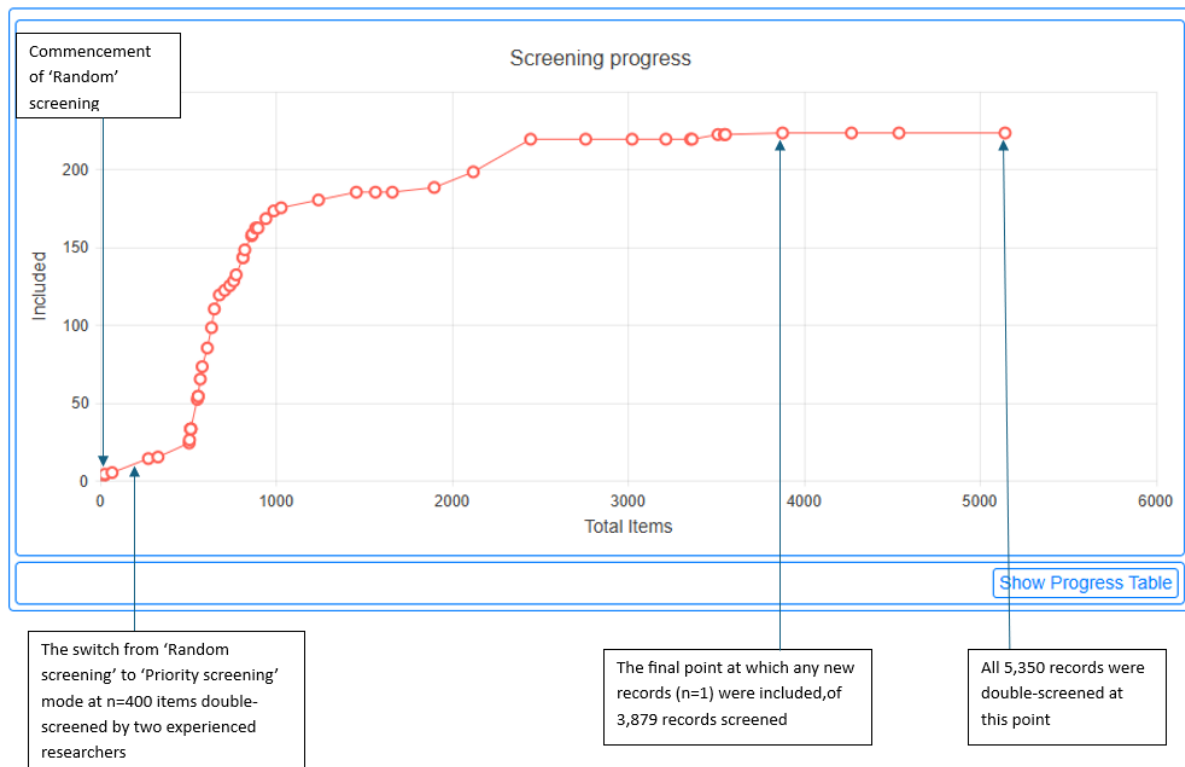
Search Limit: Publication Type: systematic reviews (inbuilt search facet rather than external search filter)

Search line	Search terms	Results
1.	(title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral	60

Search line	Search terms	Results
	<p>care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy") OR abstract:("health promotion" OR "health-promoting" OR "patient education" OR "education program" OR "educational program" OR "education programme" OR "education programme" OR "education programs" OR "educational programs" OR "education programmes" OR "education programmes" OR "education intervention" OR "educational intervention" OR "education intervention" OR "education intervention" OR "education interventions" OR "educational interventions" OR "education interventions" OR "education interventions" OR "teaching program" OR "training program" OR "training campaign" OR "teaching programs" OR "training programs" OR "training campaigns" OR "literacy promotion" OR "promotion of health" OR "health literacy" OR "literacy campaign" OR "health campaign" OR "education campaign" OR "teaching campaign" OR "health advocacy"))</p>	
2.	<p>(title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR</p>	193

Search line	Search terms	Results
3.	<p>"tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification") OR abstract:(("educational campaign" OR "dental literacy" OR "dental education" OR "oral health skills" OR "oral health literacy" OR "health campaign" OR "health campaigns" OR "oral health literacy" OR teaching OR teacher OR trainer OR training OR learning OR instructional OR "health fair" OR "health fairs" OR counselling OR advocate OR "behavior change" OR "behaviour change" OR "behavior modification" OR "behaviour modification")) (title:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels") OR abstract:(Dental* OR dentist* OR dentit* OR dentin* OR odonto* OR orthodont* OR periodont* OR endodont* OR tooth* OR teeth* OR gingiv* OR "oral health" OR "oral-health" OR "oral care" OR "oral hygiene" OR "mouth care" OR mouthcare OR "mouth health" OR "mouth hygiene" OR OHRQoL OR Caries OR carious OR karies* OR "cariès" OR carie OR DMFT OR DMF OR DMFS OR "decayed, missing, filled" OR "plaque score" OR Toothbrush* OR "tooth brush" OR "tooth brushes" OR "tooth-brush" OR "tooth-brushes" OR "tooth-brushing" OR "dental floss" OR "dental devices" OR toothpaste* OR dentifric* OR mouthrins* OR "mouth-rinse" OR mouthwash* OR "interdental cleaning aids" OR "plaque disclosing agents" OR "denture cleaner" OR "denture cleanser" OR "denture fixative" OR "saliva substitute" OR "artificial saliva" OR "fluoride gel" OR "fluoride gels")) AND (title:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile health" OR mHealth OR gamified OR gamification OR "computer-assisted") OR abstract:(("educational material" OR "teaching material" OR "teaching website" OR video OR videos OR leaflet OR leaflets OR brochure OR brochures OR pamphlet OR pamphlets OR lecture OR lectures OR "social media" OR chatbot OR "phone app" OR "mobile app" OR "phone apps" OR "mobile apps" OR "app-based" OR "mobile health" OR mHealth OR gamified OR gamification OR "computer-assisted"))</p>	55
	Total	308

Appendix C Studies excluded at full text



Graph of progress through the priority screening process for title and abstract screening

Number of records excluded during full text screening of primary search results (n=144)

Exclude code	Number excluded
EXCLUDE ON AMSTAR: inadequate literature search	1
EXCLUDE on AMSTAR: inadequate PICO	1
EXCLUDE ON AMSTAR: inadequate Risk of Bias/Quality assessment	13
EXCLUDE on Comparator	1
EXCLUDE on Empty review	1
EXCLUDE on Intervention	47
EXCLUDE on non-English language	1
EXCLUDE on Outcome	8
EXCLUDE on Population	2
EXCLUDE on Publication date	1
EXCLUDE on study design	68
Total records excluded at full-text	144

Number of records excluded during data extraction screening of primary search results (n=4)

Exclude code	Number excluded
EXCLUDE ON AMSTAR: inadequate Risk of Bias/Quality assessment	1
EXCLUDE on Intervention	1

Exclude code	Number excluded
EXCLUDE on Population	1
EXCLUDE on study design	1
Total records excluded at data extraction screening	4

Number of records excluded during full-text screening of supplemental search results (n=24)

Exclude code	Number excluded
EXCLUDE ON AMSTAR: inadequate literature search	2
EXCLUDE ON AMSTAR: inadequate Risk of Bias/Quality assessment	4
EXCLUDE on Intervention	4
EXCLUDE on Outcome	2
EXCLUDE on Population	1
EXCLUDE on study design	11
Total records excluded at full-text	24

Number of records excluded during data extraction of supplemental search results (n=4)

Exclude code	Number excluded
EXCLUDE ON Comparator	1
EXCLUDE on non-English language	1
EXCLUDE ON AMSTAR: inadequate Risk of Bias/Quality assessment	1
EXCLUDE on study design	1
Total records excluded at full-text	4

Records excluded at full text screening stage from the primary searches (n=144)

	Records excluded on publication date (n=1)
1.	Cooper AM, O'Malley LA, Elison SN, <i>et al.</i> Primary school-based behavioural interventions for preventing caries. <i>Cochrane Database Syst Rev</i> 2013;2013:CD009378. doi: https://doi.org/10.1002/14651858.CD009378.pub2

	Records excluded on study design (n=68)
1.	Ab Malik N, Zhang J, Lam OLT, <i>et al.</i> Effectiveness of computer-aided learning in oral health among patients and caregivers: a systematic review. <i>J Am Med Inform Assoc</i> 2017;24:209–17. doi: https://doi.org/10.1093/jamia/ocw045
2.	Abedi N. Meta-analysis of the effectiveness of educational interventions on dental and oral health promotion in Iran. <i>J Educ Health Promot</i> 2019;8:29. doi: https://doi.org/10.4103/jehp.jehp_305_18
3.	Ajay K, Azevedo LB, Haste A, <i>et al.</i> App-based oral health promotion interventions on modifiable risk factors associated with early childhood caries: A systematic review. <i>Front Oral Health</i> 2023;4. doi: https://doi.org/10.3389/froh.2023.1125070
4.	Akera P, Kennedy SE, Lingam R, <i>et al.</i> Effectiveness of primary school-based interventions in improving oral health of children in low- and middle-income countries: a systematic review

Records excluded on study design (n=68)

- and meta-analysis. *BMC Oral Health* 2022;22:264. doi:<https://doi.org/10.1186/s12903-022-02291-2>
5. Al-Ansari A. Oral health education interventions may improve the oral health status of older people. *Evid Based Dent* 2024;25:37–8. doi:<https://doi.org/10.1038/s41432-024-00975-y>
 6. Al-Nasser L, Lamster IB. Prevention and management of periodontal diseases and dental caries in the older adults. *Periodontol 2000* 2020;84:69–83. doi:<https://doi.org/10.1111/prd.12338>
 7. Alexandridi F, Tsantila S, Pepelassi E. Smoking cessation and response to periodontal treatment. *Australian Dental Journal* 2018;63:140–9. doi:<https://doi.org/10.1111/adj.12568>
 8. Aliakbari E, Gray-Burrows KA, Vinall-Collier KA, et al. Home-based toothbrushing interventions for parents of young children to reduce dental caries: A systematic review. *Int J Paediatr Dent* 2021;31:37–79. doi:<https://doi.org/10.1111/ipd.12658>
 9. Alshammari FR, Alsayed AA, Albakry M, et al. Evidence based recommendations to improve the children oral health in Saudi Arabia. *Saudi Dent J* 2022;34:431–44. doi:<https://doi.org/10.1016/j.sdentj.2022.06.003>
 10. Amaral AL, da Costa Andrade PA, Lwaleed BA, et al. Impacts of smoking on oral health—what is the role of the dental team in smoking cessation? *Evid Based Dent* 2023;24:186–7. doi:<https://doi.org/10.1038/s41432-023-00930-3>
 11. Aurlene N, Ravichandran S, Bish M, et al. Oral health promotion interventions in residential aged care facilities - a systematic review of behaviour change techniques used in interventions. *Community Dent Oral Epidemiol* 2025;53:465–99. doi:<https://doi.org/10.1111/cdoe.13042>
 12. Badawy SM, Kuhns LM. Texting and mobile phone app interventions for improving adherence to preventive behavior in adolescents: a systematic review. *JMIR Mhealth Uhealth* 2017;5:e50. doi:<https://doi.org/10.2196/mhealth.6837>
 13. Balla SB, Angelakopoulos N, Tadakamadla J, et al. A systematic review and meta-analysis of interventions targeted to parents for improving the oral health of children from culturally and linguistically diverse (CALD) backgrounds. *J Immigrant Minority Health* 2025;27:313–28. doi:<https://doi.org/10.1007/s10903-024-01650-1>
 14. Bashirian S, Khoshravesh S, Ayubi E, et al. The impact of health education interventions on oral health promotion among older people: a systematic review. *BMC Geriatr* 2023;23:548. doi:<https://doi.org/10.1186/s12877-023-04259-5>
 15. Bohaligah KM, Bohaligah MM, Bohaligah SM. Preventive strategies for pediatric health in primary healthcare: a systematic review. *Cureus* 2025;17:e78719. doi:<https://doi.org/10.7759/cureus.78719>
 16. Chandio N, Micheal S, Tadakmadla SK, et al. Barriers and enablers in the implementation and sustainability of toothbrushing programs in early childhood settings and primary schools: a systematic review. *BMC Oral Health* 2022;22:242. doi:<https://doi.org/10.1186/s12903-022-02270-7>
 17. Cheng H, Chen R, Milosevic M, et al. Interventions targeting bottle and formula feeding in the prevention and treatment of early childhood caries, overweight and obesity: an integrative review. *Int J Environ Res Public Health* 2021;18:12304. doi:<https://doi.org/10.3390/ijerph182312304>
 18. Chi DL. Motivational interviewing–based approaches in dental practice settings may improve oral health behaviors and outcomes. *J Evid Based Dent Pract* 2017;17:420–1. doi:<https://doi.org/10.1016/j.jebdp.2017.10.001>
 19. Chicote A. Care aide abilities in oral care delivery and seniors’ oral health outcomes. *Can J Dent Hyg* 2019;53:178–81. <https://pubmed.ncbi.nlm.nih.gov/articles/PMC7533799/>
 20. Choi M-S, Kim D-K. Reviews of Literature on Dental Plaque Control and Oral Hygiene Education in Korea. *J Dent Hyg Sci* 2017;17:87–98. doi:<https://doi.org/10.17135/jdhs.2017.17.2.87>
 21. Dallagiacomma G, Ferrara P, Alberti F, et al. The use of digital tools to promote health in children: A systematic review of intervention studies. *Eur J Public Health* 2022;32:ckac130.163. doi:<https://doi.org/10.1093/eurpub/ckac130.163>
 22. de Silva AM, Hegde S, Akudo Nwagbara B, et al. WITHDRAWN: Community-based population-level interventions for promoting child oral health. *Cochrane Database Syst Rev* 2016;12:CD009837. doi:<https://doi.org/10.1002/14651858.CD009837.pub3>

Records excluded on study design (n=68)	
23.	Elsadek YE, Edwebi S, Turner A, et al. A systematic review of school-based student peer-led oral health interventions to promote the oral health of school children. <i>BMC Oral Health</i> 2023;23:742. doi: https://doi.org/10.1186/s12903-023-03482-1
24.	Fadl RAE, Blair M, Hassounah S. Integrating Maternal and Children's Oral Health Promotion into Nursing and Midwifery Practice- A Systematic Review. <i>PLOS ONE</i> 2016;11:e0166760. doi: https://doi.org/10.1371/journal.pone.0166760
25.	Faisal MR, Mishu MP, Jahangir F, et al. The effectiveness of behaviour change interventions delivered by non-dental health workers in promoting children's oral health: A systematic review and meta-analysis. <i>PLoS One</i> 2022;17:e0262118. doi: https://doi.org/10.1371/journal.pone.0262118
26.	Farrokhi F, Ghorbani Z, Farrokhi F, et al. Social media as a tool for oral health promotion: A systematic review. <i>PLoS One</i> 2023;18:e0296102. doi: https://doi.org/10.1371/journal.pone.0296102
27.	Ghaffari M, Rakhshanderou S, Ramezankhani A, et al. Are educating and promoting interventions effective in oral health?: A systematic review. <i>International Journal of Dental Hygiene</i> 2018;16:48–58. doi: https://doi.org/10.1111/idh.12305
28.	Ghaffari M, Rakhshanderou S, Ramezankhani A, et al. Oral health education and promotion programmes: meta-analysis of 17-year intervention. <i>Int J Dent Hyg</i> 2018;16:59–67. doi: https://doi.org/10.1111/idh.12304
29.	Gwynn J, Skinner J, Dimitropoulos Y, et al. Community based programs to improve the oral health of Australian Indigenous adolescents: a systematic review and recommendations to guide future strategies. <i>BMC Health Serv Res</i> 2020;20:384. doi: https://doi.org/10.1186/s12913-020-05247-w
30.	Holmes RD. Psychology of behaviour change is key to effective oral health promotion. <i>Evid Based Dent</i> 2016;17:70–1. doi: https://doi.org/10.1038/sj.ebd.6401180
31.	Holmes RD. Insufficient evidence for the role of school dental screening in improving oral health. <i>Evid Based Dent</i> 2018;19:3–4. doi: https://doi.org/10.1038/sj.ebd.6401281
32.	Innes N, Fee PA. Is personal oral hygiene advice effective in preventing coronal dental caries? <i>Evid Based Dent</i> 2019;20:52–3. doi: https://doi.org/10.1038/s41432-019-0028-3
33.	Jönsson B, Abrahamsson KH. Overcoming behavioral obstacles to prevent periodontal disease: Behavioral change techniques and self-performed periodontal infection control. <i>Periodontology</i> 2000 2020;84:134–44. doi: https://doi.org/10.1111/prd.12334
34.	Kay EJ, Vascott D, Hocking A, et al. Motivational interviewing in general dental practice: A review of the evidence. <i>Br Dent J</i> 2016;221:785–91. doi: https://doi.org/10.1038/sj.bdj.2016.952
35.	Kazemian A, Hoseinzadeh M, Banihashem Rad SA, et al. Nudging oral habits; application of behavioral economics in oral health promotion: a critical review. <i>Front Public Health</i> 2023;11. doi: https://doi.org/10.3389/fpubh.2023.1243246
36.	Lattanzi AP dos S, Silveira FM, Guimarães L, et al. Effects of oral health promotion programmes on adolescents' oral health-related quality of life: A systematic review. <i>International Journal of Dental Hygiene</i> 2020;18:228–37. doi: https://doi.org/10.1111/idh.12440
37.	Linden J, Fletcher R. Clearing the smoke: are tobacco cessation interventions by the dental team successful? <i>Evid Based Dent</i> 2023;24:190–1. doi: https://doi.org/10.1038/s41432-023-00926-z
38.	Mardiah A. Improving awareness and clean and healthy living behavior among students in preventing dental caries. <i>Path of Science</i> 2023;9:2023–9. doi: https://doi.org/10.22178/pos.94-7
39.	Martin T. Oral health behaviors, attitudes, and dental diseases in native American/Alaskan native school-age children. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering Published Online First</i> : 2022. https://scholarworks.waldenu.edu/dissertations/12770/
40.	Matoso B da SM. Programa Escolas Promotoras de Saúde: processo inicial de implementação em Belo Horizonte/MG [Health Promoting School: initial implementation process in Belo Horizonte/MG/Brazil]. 2023. https://hdl.handle.net/1843/58396 (accessed 10 Feb 2026).
41.	Memon S, Memon P, Maqbool A, et al. The impact of school-based caries prevention programs on DMFT scores and oral health behaviors in school children: school-based caries prevention

Records excluded on study design (n=68)	
	programs on DMFT scores. <i>Pakistan Journal of Health Sciences</i> 2024;:261–9. doi: https://doi.org/10.54393/pjhs.v5i09.2069
42.	Menegaz AM, Silva AER, Cascaes AM. Educational interventions in health services and oral health: systematic review. <i>Rev Saude Publica</i> 2018;52:52. doi: https://doi.org/10.11606/S1518-8787.2018052000109
43.	Mohammadzadeh N, Gholamzadeh M, Zahednamazi S, et al. Mobile health applications for children’s oral health improvement: A systematic review. <i>Inform Med Unlocked</i> 2023;37:101189. doi: https://doi.org/10.1016/j.imu.2023.101189
44.	Moynihan P, Tanner LM, Holmes RD, et al. Systematic review of evidence pertaining to factors that modify risk of early childhood caries. <i>JDR Clin Trans Res</i> 2019;4:202–16. doi: https://doi.org/10.1177/2380084418824262
45.	Na (여안나) YA, Lee SY(이수영). A systematic review of domestic oral health care programs for elementary school children (초등학생 대상의 국내 구강건강관리 프로그램에 대한 체계적 문헌고찰). <i>Journal of Korean society of Dental Hygiene (한국치위생학회지)</i> 2020;20:257–68. doi: https://doi.org/10.13065/jksdh.20200024
46.	Northridge ME, Schrimshaw EW, Estrada I, et al. Intergenerational and social interventions to improve children’s oral health. <i>Dent Clin North Am</i> 2017;61:533–48. doi: https://doi.org/10.1016/j.cden.2017.02.003
47.	Oliveira dos Santos CC, Miranda IML, Thuller K, et al. The impact of domiciliary dental care and oral health promotion in nursing homes of older adults: a systematic review. <i>Int J Environ Res Public Health</i> 2025;22. doi: https://doi.org/10.3390/ijerph22050683
48.	Paisi M, Booth J, Doughty J. What is the evidence on the effectiveness of strategies to integrate oral health into primary care? <i>Evid Based Dent</i> 2024;25:23–4. doi: https://doi.org/10.1038/s41432-023-00962-9
49.	Patel NH. Assessing oral health literacy levels among children and caregivers, evaluating the effectiveness of oral health education programs in schools and community settings, and identifying areas for improvement. <i>Int J Med Oral Res</i> 2024;9:14. doi: https://doi.org/10.4103/ijmo.ijmo_6_24
50.	Peng S, McGrath C. What can we do to prevent small children from suffering from tooth decay? <i>Evid Based Dent</i> 2020;21:90–1. doi: https://doi.org/10.1038/s41432-020-0111-9
51.	Quach H. How can children be involved in developing oral health education interventions? <i>Evid Based Dent</i> 2020;21:104–5. doi: https://doi.org/10.1038/s41432-020-0122-6
52.	Riggs E, Rajan S, Casey S, et al. Refugee child oral health. <i>Oral Dis</i> 2017;23:292–9. doi: https://doi.org/10.1111/odi.12530
53.	Sanaei Nasab H, Yazdani M, Mokhayeri Y, et al. The role of psychological theories in oral health interventions: A systematic review and meta-analysis. <i>Int J Dent Hyg</i> 2019;17:142–52. doi: https://doi.org/10.1111/idh.12386
54.	Sasikala D, Baghkomeh PN, Farzan JM, et al. Use of social media by parents as a resource for knowledge on children’s oral health: a systematic review. <i>Can J Dent Hyg</i> 2025;59:45–58. https://pubmed.ncbi.nlm.nih.gov/articles/PMC11961065/
55.	Seo K, Kim H-N. Effects of oral health programmes on xerostomia in community-dwelling elderly: A systematic review and meta-analysis. <i>Int J Dent Hyg</i> 2020;18:52–61. doi: https://doi.org/10.1111/idh.12418
56.	Sharma S, Mohanty V, Balappanavar AY, et al. Role of digital media in promoting oral health: a systematic review. <i>Cureus</i> 2022;14:e28893. doi: https://doi.org/10.7759/cureus.28893
57.	Skeie MS, Klock KS. Dental caries prevention strategies among children and adolescents with immigrant - or low socioeconomic backgrounds- do they work? A systematic review. <i>BMC Oral Health</i> 2018;18:20. doi: https://doi.org/10.1186/s12903-018-0478-6
58.	Soldani F, Wu J. School based oral health education. <i>Evid Based Dent</i> 2018;19:36–7. doi: https://doi.org/10.1038/sj.ebd.6401298
59.	Spolarich AE. High-tech hygiene: technologies making a difference in oral care. <i>Compendium of continuing education in dentistry (Jamesburg, NJ : 1995)</i> 2016;37:e1–4. https://cced.cdeworld.com/courses/5020-high-tech-hygiene-technologies-making-a-difference-in-oral-care

Records excluded on study design (n=68)	
60.	Takehara S, Karawekpanyawong R, Okubo H, et al. Oral health promotion under the 8020 campaign in Japan—a systematic review. <i>Int J Environ Res Public Health</i> 2023;20. doi: https://doi.org/10.3390/ijerph20031883
61.	Tiwari T, Jamieson L, Broughton J, et al. Reducing indigenous oral health inequalities: a review from 5 nations. <i>J Dent Res</i> 2018;97:869–77. doi: https://doi.org/10.1177/0022034518763605
62.	van Nes KA, van Loveren C, Luteijn MF, et al. Health action process approach in oral health behaviour: Target interventions, constructs and groups—A systematic review. <i>Int J Dent Hyg</i> 2023;21:59–76. doi: https://doi.org/10.1111/idh.12628
63.	Vercammen KA, Frelrier JM, Lowery CM, et al. A systematic review of strategies to reduce sugar-sweetened beverage consumption among 0-year to 5-year olds. <i>Obes Rev</i> 2018;19:1504–24. doi: https://doi.org/10.1111/obr.12741
64.	Wang K, Yu KF, Liu P, et al. Can mHealth promotion for parents help to improve their children’s oral health? A systematic review. <i>J Dent</i> 2022;123:104185. doi: https://doi.org/10.1016/j.jdent.2022.104185
65.	Wang T-F, Huang C-M, Chou C, et al. Effect of oral health education programs for caregivers on oral hygiene of the elderly: A systemic review and meta-analysis. <i>Int J Nurs Stud</i> 2015;52:1090–6. doi: https://doi.org/10.1016/j.ijnurstu.2015.01.015
66.	Weening-Verbree LF, Douma A, van der Schans CP, et al. Oral health care in older people in long-term care facilities: An updated systematic review and meta-analyses of implementation strategies. <i>Int J Nurs Stud Adv</i> 2025;8:100289. doi: https://doi.org/10.1016/j.ijnsa.2024.100289
67.	Xiao J, Alkhers N, Kopycka-Kedzierawski DT, et al. Prenatal oral health care and early childhood caries prevention: a systematic review and meta-analysis. <i>Caries Res</i> 2019;53:411–21. doi: https://doi.org/10.1159/000495187
68.	Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis. <i>Br Dent J</i> 2018;224:357–357. doi: https://doi.org/10.1038/sj.bdj.2018.195
Records excluded as empty reviews (n=1)	
1.	Al Rawahi SH, Asimakopoulou K, Newton JT. Theory based interventions for caries related sugar intake in adults: systematic review. <i>BMC Psychol</i> 2017;5:25. doi: https://doi.org/10.1186/s40359-017-0194-z
Records excluded as written in a non-English language (n=1)	
1.	Herrera-Valverde J, Allende-Trejo LE. Efecto de las modalidades de mHealth para la prevención y control del biofilm dental en escolares: Revisión sistemática y meta-análisis. <i>CyRS</i> 2025;7:30–45. doi: https://doi.org/10.22201/fesz.26831422e.2025.7.1.4
Records excluded on population (n=2)	
1.	Cartes-Velásquez R, Varnet-Pérez T, Martínez-Delgado CM, et al. Motivational interviewing for preventing oral morbidities in adults: Systematic review and meta-analysis. <i>Community Dent Oral Epidemiol</i> 2024;52:84–92. doi: https://doi.org/10.1111/cdoe.12904
2.	Zhou N, Zhou L, Ho CYT, et al. Social story intervention for training expected behaviors among preschool children: a systematic review and meta-analysis. <i>Int J Environ Res Public Health</i> 2024;21:940. doi: https://doi.org/10.3390/ijerph21070940
Records excluded on intervention (n=47)	
1.	Aimée NR, Damé-Teixeira N, Alves LS, et al. Responsiveness of oral health-related quality of life questionnaires to dental caries interventions: systematic review and meta-analysis. <i>Caries Res</i> 2019;53:585–98. doi: https://doi.org/10.1159/000500855
2.	Albano MG, d’Ivernois JF, de Andrade V, et al. Patient education in dental medicine: A review of the literature. <i>Eur J Dent Educ</i> 2019;23:110–8. doi: https://doi.org/10.1111/eje.12409

	Records excluded on intervention (n=47)
3.	Armanasco AA, Miller YD, Fjeldsoe BS, et al. Preventive health behavior change text message interventions: a meta-analysis. <i>Am J Prev Med</i> 2017;52:391–402. doi: https://doi.org/10.1016/j.amepre.2016.10.042
4.	Arora A, Kumbargere Nagraj S, Khattri S, et al. School dental screening programmes for oral health. <i>Cochrane Database Syst Rev</i> 2022;7:CD012595. doi: https://doi.org/10.1002/14651858.CD012595.pub4
5.	Azami-Aghdash S, Ebadi SS, Sardareh M, et al. The impact of professional oral health care on the oral health of older people: a systematic review and meta-analysis. <i>BMC Oral Health</i> 2024;24:1558. doi: https://doi.org/10.1186/s12903-024-05382-4
6.	Azami-Aghdash S, Pournaghi-Azar F, Nouri M, et al. Effectiveness of community-based interventions in improving the oral & dental health of the elderly people: a systematic review and meta-analysis. <i>J Holist Nurs Midwifery</i> 2024;34:48–63. doi: https://doi.org/10.32598/jhnm.34.1.2510
7.	Borrelli B, Tooley EM, Scott-Sheldon LAJ. Motivational Interviewing for Parent-child Health Interventions: A Systematic Review and Meta-Analysis. <i>Pediatr Dent</i> 2015;37:254–65. https://www.ingentaconnect.com/content/aapd/pd/2015/00000037/00000003/art00006
8.	Carra MC, Detzen L, Kitzmann J, et al. Promoting behavioural changes to improve oral hygiene in patients with periodontal diseases: A systematic review. <i>J Clin Periodontol</i> 2020;47:72–89. doi: https://doi.org/10.1111/jcpe.13234
9.	Chou R, Pappas M, Dana T, et al. Screening and interventions to prevent dental caries in children younger than age five years: a systematic review for the U.S. Preventive Services Task Force. Evidence synthesis, no. 210. Agency for Healthcare Research and Quality (US) 2021. http://www.ncbi.nlm.nih.gov/books/NBK575915/
10.	Das A, Orlan E, Duncan K, et al. Areca nut and betel quid control interventions: halting the epidemic. <i>Subst Use Misuse</i> 2020;55:1552–9. doi: https://doi.org/10.1080/10826084.2019.1686022
11.	de Oliveira Júnior AJ, Oliveira JM, Bretz YP, et al. Online social networks for prevention and promotion of oral health: a systematic review. <i>Can J Dent Hyg</i> 2023;57:83–97.
12.	dos Santos APP, de Oliveira BH, Nadanovsky P. A systematic review of the effects of supervised toothbrushing on caries incidence in children and adolescents. <i>Int J Paediatr Dent</i> 2018;28:3–11. doi: https://doi.org/10.1111/ipd.12334
13.	Fernández CE, Maturana CA, Coloma SI, et al. Teledentistry and mHealth for promotion and prevention of oral health: a systematic review and meta-analysis. <i>J Dent Res</i> 2021;100:914–27. doi: https://doi.org/10.1177/00220345211003828
14.	Harries MD, Xu N, Bertenthal MS, et al. Community health workers in schools: a systematic review. <i>Acad Pediatr</i> 2023;23:14–23. doi: https://doi.org/10.1016/j.acap.2022.08.015
15.	Hayre J, Pearce H, Khera R, et al. Health impacts of the Sure Start programme on disadvantaged children in the UK: a systematic review. <i>BMJ Open</i> 2025;15:e089983. doi: https://doi.org/10.1136/bmjopen-2024-089983
16.	Henry JA, Muthu MS, Swaminathan K, et al. Do oral health educational programmes for expectant mothers prevent early childhood caries? - systematic review. <i>Oral Health Prev Dent</i> 2017;15:215–21. doi: https://doi.org/10.3290/j.ohpd.a38522
17.	Hoben M, Kent A, Kobagi N, et al. Effective strategies to motivate nursing home residents in oral care and to prevent or reduce responsive behaviors to oral care: A systematic review. <i>PLOS ONE</i> 2017;12:e0178913. doi: https://doi.org/10.1371/journal.pone.0178913
18.	Hollands GJ, Usher-Smith JA, Hasan R, et al. Visualising health risks with medical imaging for changing recipients' health behaviours and risk factors: Systematic review with meta-analysis. <i>PLOS Medicine</i> 2022;19:e1003920. doi: https://doi.org/10.1371/journal.pmed.1003920
19.	Ismail SR, Radzi R, Megat Kamaruddin PSN, et al. The effects of school-based hygiene intervention programme: Systematic review and meta-analysis. <i>PLoS One</i> 2024;19:e0308390. doi: https://doi.org/10.1371/journal.pone.0308390
20.	James Y, Nadeem A, Carpenter F, et al. Role of the early detection and prevention of dental caries in children: a systematic review of clinical outcomes. <i>Cureus</i> 2025;17. doi: https://doi.org/10.7759/cureus.85185

	Records excluded on intervention (n=47)
21.	Järvinen M, Stolt M, Honkala E, et al. Behavioural interventions that have the potential to improve self-care in adults with periodontitis: a systematic review. <i>Acta Odontol Scand</i> 2018;76:612–20. doi: https://doi.org/10.1080/00016357.2018.1490964
22.	John DA, McGowan LJ, Kenny RPW, et al. Interventions to improve oral health and related health behaviours of substance use, smoking, and diet in people with severe and multiple disadvantage: a systematic review of effectiveness and cost-effectiveness. <i>Lancet</i> 2023;402 Suppl 1:S58. doi: https://doi.org/10.1016/S0140-6736(23)02151-7
23.	Kaneyasu Y, Shigeishi H, Sugiyama M, et al. Effectiveness of e-learning to promote oral health education: A systematic review and meta-analysis. <i>Medicine</i> 2023;102:e36550. doi: https://doi.org/10.1097/MD.00000000000036550
24.	Khan MA, Okeah BO, Mbivnjon EL, et al. The role of community health workers in oral health promotion and the impact of their services in sub-saharan africa: a systematic review. <i>S Afr Dent J</i> 2022;77:285–93. doi: https://doi.org/10.17159/2519-0105/2022/v77no5a5
25.	Kopp SL, Ramseier CA, Ratka-Krüger P, et al. Motivational interviewing as an adjunct to periodontal therapy-a systematic review. <i>Front Psychol</i> 2017;8:279. doi: https://doi.org/10.3389/fpsyg.2017.00279
26.	Kouassi SM, Salomon-Ibarra CC, Hosey MT, et al. Effectiveness of preventive intervention programmes aiming to improve oral health in children who have undergone caries-related dental extractions: a rapid review. <i>Community Dental Health</i> 2024;41:208–14. doi: https://doi.org/10.1922/CDH_00107Kouassi07
27.	Low L-F, Fletcher J, Goodenough B, et al. A systematic review of interventions to change staff care practices in order to improve resident outcomes in nursing homes. <i>PLOS ONE</i> 2015;10:e0140711. doi: https://doi.org/10.1371/journal.pone.0140711
28.	Luai AF, Malek AA, Hassan EH, et al. Effectiveness of immersive technologies in oral health promotion and education: A systematic review. <i>J Dent</i> 2024;150:105324. doi: https://doi.org/10.1016/j.jdent.2024.105324
29.	Ly-Mapes O, Jang H, Al Jallad N, et al. Effectiveness of interventions on improving early-life dental care utilization: a systematic review and meta-analysis. <i>Quintessence Int</i> 2024;55:722–32. doi: https://doi.org/10.3290/j.qi.b5640008
30.	Manek S, Jawdekar AM, Katre AN. The effect of motivational interviewing on reduction of new carious lesions in children with early childhood caries: a systematic review and meta-analysis. <i>Int J Clin Pediatr Dent</i> 2023;16:112–23. doi: https://doi.org/10.5005/jp-journals-10005-2497
31.	McGowan LJ, John DA, Kenny RPW, et al. Improving oral health and related health behaviours (substance use, smoking, diet) in people with severe and multiple disadvantage: A systematic review of effectiveness and cost-effectiveness of interventions. <i>PLoS One</i> 2024;19:e0298885. doi: https://doi.org/10.1371/journal.pone.0298885
32.	McGowan L, McCrum L-A, Watson S, et al. The impact of oral rehabilitation coupled with healthy dietary advice on the nutritional status of adults: A systematic review and meta-analysis. <i>Critical Reviews in Food Science and Nutrition</i> 2020;60:2127–47. doi: https://doi.org/10.1080/10408398.2019.1630600
33.	Mortazavi S, Kazemi A, Faghihian R. Impact of motivational interviewing on parental risk-related behaviors and knowledge of early childhood caries: a systematic review. <i>Int J Prev Med</i> 2021;12:167. doi: https://doi.org/10.4103/ijpvm.IJPVM_600_20
34.	Mosdøl A, Forsetlund L, Straumann GH. Effect of parent education on ways to prevent dental caries in pre-school children No. 24-2015. Oslo, Norway: Norwegian Knowledge Centre for the Health Services (NOKC) 2015. https://www.ncbi.nlm.nih.gov/books/NBK390568/
35.	Newton JT, Asimakopoulou K. Managing oral hygiene as a risk factor for periodontal disease: a systematic review of psychological approaches to behaviour change for improved plaque control in periodontal management. <i>J Clin Periodontol</i> 2015;42:S36–46. doi: https://doi.org/10.1111/jcpe.12356
36.	Newton JT, Asimakopoulou K. Behavioral models for periodontal health and disease. <i>Periodontol</i> 2000 2018;78:201–11. doi: https://doi.org/10.1111/prd.12236
37.	Patil S, Licari FW, Bhandi S, et al. Effect of game-based teaching on the oral health of children: a systematic review of randomised control trials. <i>J Clin Pediatr Dent</i> 2024;48:26–37. doi: https://doi.org/10.22514/jocpd.2024.075

Records excluded on intervention (n=47)	
38.	Raison H, Corcoran R, Harris RV. A systematic review of interventions using cue-automaticity to improve the uptake of preventive healthcare in adults: applications to dental visiting. <i>Community Dent Health</i> 2018;35:37–46. doi: https://doi.org/10.1922/CDH_4174Raison10
39.	Scherer CI, Scherer MD dos A. Advances and challenges in oral health after a decade of the “Smiling Brazil” Program. <i>Rev Saúde Pública</i> 2015;49:98. doi: https://doi.org/10.1590/S0034-8910.2015049005961
40.	Sharif MO, Newton T, Cunningham SJ. A systematic review to assess interventions delivered by mobile phones in improving adherence to oral hygiene advice for children and adolescents. <i>Br Dent J</i> 2019;227:375–82. doi: https://doi.org/10.1038/s41415-019-0660-5
41.	Smith L, Blinkhorn FA, Blinkhorn AS, et al. Prevention of dental caries in Indigenous children from World Health Organization–listed high-income countries: A systematic review. <i>Health Educ J</i> 2018;77:332–48. doi: https://doi.org/10.1177/0017896917749264
42.	Strobel NA, Chamberlain C, Campbell SK, et al. Family-centred interventions for Indigenous early childhood well-being by primary healthcare services. <i>Cochrane Database Syst Rev</i> 2022;12:CD012463. doi: https://doi.org/10.1002/14651858.CD012463.pub2
43.	Toniazzo MP, Nodari D, Muniz FWMG, et al. Effect of mHealth in improving oral hygiene: A systematic review with meta-analysis. <i>Journal of Clinical Periodontology</i> 2019;46:297–309. doi: https://doi.org/10.1111/jcpe.13083
44.	Vivek VS, James A, Janakiram C, et al. Impact of oral health literacy on oral conditions among different population groups (A systematic review and meta-analysis). <i>Journal of Health Literacy</i> 2024;9:88–105. doi: https://doi.org/10.22038/jhl.2024.78396.1544
45.	von Philipsborn P, Stratil JM, Burns J, et al. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. <i>Cochrane Database Syst Rev</i> 2019;6:CD012292. doi: https://doi.org/10.1002/14651858.CD012292.pub2
46.	Werner H, Hakeberg M, Dahlström L, et al. Psychological interventions for poor oral health: a systematic review. <i>J Dent Res</i> 2016;95:506–14. doi: https://doi.org/10.1177/0022034516628506
47.	Zarkadi AE, Galanis P. Oral health promoting programs at a community level: a systematic review. <i>Int J Caring Sci</i> 2021;14:441–60. https://www.internationaljournalofcaringsciences.org/docs/47_galanis_original_14_1.pdf

Records excluded on outcome (n=8)	
1.	Ahuja NA, Kedia SK, Ward KD, et al. Effectiveness of interventions to improve oral cancer knowledge: a systematic review. <i>J Canc Educ</i> 2022;37:479–98. doi: https://doi.org/10.1007/s13187-021-01963-x
2.	Aliakbari E, Gray-Burrows KA, Vinnall-Collier KA, et al. Facilitators and barriers to home-based toothbrushing practices by parents of young children to reduce tooth decay: a systematic review. <i>Clin Oral Invest</i> 2021;25:3383–93. doi: https://doi.org/10.1007/s00784-021-03890-z
3.	Ebrahimi T, Farokhi MR. Effectiveness of oral health education interventions on oral health literacy levels in adults; a systematic review. <i>medRxiv Published Online First</i> : 2022. doi: https://doi.org/10.1101/2022.04.04.22273407
4.	Holliday R, Hong B, McColl E, et al. Interventions for tobacco cessation delivered by dental professionals. <i>Cochrane Database Syst Rev</i> 2021;2:CD005084. doi: https://doi.org/10.1002/14651858.CD005084.pub4
5.	Ingleshwar A, John MT, Chanthavisouk P, et al. Oral health impact of dental hygiene and dental therapy patient populations—an evidence update in 2024. <i>J Evid Based Dent Pract</i> 2025;25:102083. doi: https://doi.org/10.1016/j.jebdp.2024.102083
6.	Malhotra S, Aggarwal D, Purohit BM, et al. Effectiveness of school-based approaches for reduction of sugar and sugar-sweetened beverages in children: a systematic review and meta-analysis. <i>Evid Based Dent</i> 2025;26:113. doi: https://doi.org/10.1038/s41432-024-01103-6
7.	Moore CJ, Taylor AM, Cowap S, et al. Behavior change techniques to reduce sugars intake by adolescents: a systematic review. <i>JDR Clin Trans Res</i> 2025;10:227–45. doi: https://doi.org/10.1177/23800844241280717

Records excluded on outcome (n=8)	
8.	Saini RS, Chopra S, Assiri YA, et al. Impact of mHealth and eHealth on oral health literacy: A systematic review. <i>Digit Health</i> 2025;11:20552076251360955. doi: https://doi.org/10.1177/20552076251360955
Records excluded on comparator (n=1)	
1.	Hillebrecht A-L, Höfer K, Blasi A, et al. Comparison of facilitators and barriers to providing oral hygiene measures in dependent older people and young children: A systematic review. <i>Gerodontology</i> 2024;41:111–24. doi: https://doi.org/10.1111/ger.12684
Records excluded on AMSTAR: inadequate Risk of Bias/Quality assessment (n=13)	
1.	Abbinante A, Antonacci A, Antonioni M, et al. Concordance and clinical outcomes improvement following oral hygiene motivation: a systematic review and report of the workshop of the Italian Societies of Dental Hygiene. <i>Int J Dent</i> 2024;2024:8592336. doi: https://doi.org/10.1155/2024/8592336
2.	Bramantoro T, Santoso CMA, Hariyani N, et al. Effectiveness of the school-based oral health promotion programmes from preschool to high school: A systematic review. <i>PloS One</i> 2021;16:e0256007. doi: https://doi.org/10.1371/journal.pone.0256007
3.	Fraihat N, Madae'en S, Bencze Z, et al. Clinical effectiveness and cost-effectiveness of oral-health promotion in dental caries prevention among children: systematic review and meta-analysis. <i>Int J Environ Res Public Health</i> 2019;16. doi: https://doi.org/10.3390/ijerph16152668
4.	Gandha Wijaya H, Shaluhyah Z, Septo Pawelas A. Improving students' oral hygiene through school dental health program: a meta-analysis. <i>J Matern Child Health</i> 2024;9:857–69. doi: https://doi.org/10.26911/thejmch.2024.09.06.01
5.	Jahanshahi R, Amanzadeh S, Mirzaei F, et al. Does motivational interviewing prevent early childhood caries? A systematic review and meta-analysis. <i>J Dent (Shiraz)</i> 2022;23:161–8. doi: https://doi.org/10.30476/dentjods.2021.87985.1303
6.	Joufi AI, Claiborne DM, Shuman D. Oral health education and promotion activities by early head start programs in the united states: a systematic review. <i>J Dent Hyg</i> 2021;95:14–21. https://jdh.adha.org/content/95/5/14
7.	Kay E, Vascott D, Hocking A, et al. A review of approaches for dental practice teams for promoting oral health. <i>Community Dent Oral Epidemiol</i> 2016;44:313–30. doi: https://doi.org/10.1111/cdoe.12220
8.	Loy F, Underwood B, Stevens C. Watch and learn? A systematic review comparing oral health educational videos with written patient information aimed at parents/carers or children. <i>Br Dent J Published Online First</i> : 2021. doi: https://doi.org/10.1038/s41415-021-3616-5
9.	Madawana AM, Nawi MAA, Hassan A. Effectiveness of different oral health interventions on plaque and gingivitis incidence in children under seven years of age: a systematic review and meta-analysis. <i>Cureus</i> 2024;16:e67395. doi: https://doi.org/10.7759/cureus.67395
10.	Moafa I, Hoving C, Bart van den B, et al. Identifying behavior change techniques used in tobacco cessation interventions by oral health professionals and their relation to intervention effects-a review of the scientific literature. <i>Int J Environ Res Public Health</i> 2021;18. doi: https://doi.org/10.3390/ijerph18147481
11.	Moore J, Bond K, Turner LW. Reducing chronic disease risk through positive oral health practices: a systematic review of school-based dental health programs. <i>Am J Health Ed</i> 2022;53:133–41. doi: https://doi.org/10.1080/19325037.2022.2048749
12.	Teixeira de Faria Campestrini N, Munhoz da Cunha B, de Oliveira Kublitski PM, et al. Atividades educativas em saúde bucal desenvolvidas por cirurgiões-dentistas com escolares: uma revisão sistematizada da literatura. <i>Rev Abeno</i> 2019;19:46–54. doi: https://doi.org/10.30979/rev.abeno.v19i4.886
13.	Vamos CA, Thompson EL, Avendano M, et al. Oral health promotion interventions during pregnancy: a systematic review. <i>Community Dent Oral Epidemiol</i> 2015;43:385–96. doi: https://doi.org/10.1111/cdoe.12167

Records excluded on AMSTAR: inadequate PICO (n=1)	
1.	Aurlene N, Manipal S, Rajmohan, et al. The effectiveness of health belief model as an educational intervention in improvement of oral hygiene: A systematic review. Indian J Public Health Res Develop 2020;11:385–9. doi:https://doi.org/10.37506/v11/i1/2020/ijphrd/193851

Records excluded on AMSTAR: inadequate literature search (n=2)	
1.	Anwar AI, Supiaty, Hasyim R. The effectiveness of game-based education on dental and oral health behavior: Systematic review. Open J Clin Med Images 2022;2. doi:https://doi.org/10.52768/2833-2725/1018
2.	Manoranjitha BS, M SK, Pushpanjali K. A systematic review of health education theories and approaches in improving the oral health behaviour among adults. Int J Community Med Public Health 2017;4:286–93. doi:https://doi.org/10.18203/2394-6040.ijcmph20170251

Records excluded during data extraction of primary search results (n=4)

Records excluded on study design (n=1)	
1.	Chau RCW, Thu KM, Chaurasia A, et al. A systematic review of the use of mHealth in oral health education among older adults. Dent J 2023;11. doi:https://doi.org/10.3390/dj11080189

Records excluded on population (n=1)	
1.	Soldani FA, Lamont T, Jones K, et al. One-to-one oral hygiene advice provided in a dental setting for oral health. Cochrane Database Syst Rev 2018;10:CD007447. doi:https://doi.org/10.1002/14651858.CD007447.pub2

Records excluded on intervention (n=1)	
1.	Oliveira LM, Pazinato J, Zanatta FB. Are oral hygiene instructions with aid of plaque-disclosing methods effective in improving self-performed dental plaque control? A systematic review of randomized controlled trials. Int J Dent Hyg 2021;19:239–54. doi:https://doi.org/10.1111/idh.12491

Records excluded on AMSTAR: inadequate Risk of Bias/Quality assessment (n=1)	
1.	George A, Sousa MS, Kong AC, et al. Effectiveness of preventive dental programs offered to mothers by non-dental professionals to control early childhood dental caries: a review. BMC Oral Health 2019;19:172. doi:https://doi.org/10.1186/s12903-019-0862-x

Records excluded during full text screening of supplemental search results (n=24)

Records excluded on AMSTAR: Inadequate literature search (n=2)	
1.	Anwar AI, Supiaty, Hasyim R. The effectiveness of game-based education on dental and oral health behavior: Systematic review. Open J Clin Med Images 2022;2. doi:https://doi.org/10.52768/2833-2725/1018
2.	Manoranjitha BS, M SK, Pushpanjali K. A systematic review of health education theories and approaches in improving the oral health behaviour among adults. International Journal Of Community Medicine And Public Health 2017;4:286–93. doi:10.18203/2394-6040.ijcmph20170251

Records excluded on AMSTAR: inadequate Risk of Bias/Quality assessment (n=4)	
1.	Attamimi MPA s. Efektivitas edukasi dalam meningkatkan perilaku kesehatan mulut di wilayah asia: systematic review = effectiveness of education in improving oral health

Records excluded on AMSTAR: inadequate Risk of Bias/Quality assessment (n=4)	
	behavior in asia: systematic review [Thesis]. Universitas Hasanuddin 2022. https://repository.unhas.ac.id/id/eprint/13490/
2.	Hazavehei SMM, Gheysvandi E, Salimi N, et al. Effect of educational interventions in improving oral and dental health promotion behaviors in pregnant women: a systematic review. 26–15:18;2017 پژوهان http://psj.umsha.ac.ir/article-1-305-en.html
3.	Sari J. Intervenções para a educação em saúde bucal com adolescentes : uma revisão sistemática da literatura ; Interventions for oral health education with adolescents : a systematic review [Thesis]. Universidade Federal do Rio Grande do Sul. 2017. http://hdl.handle.net/10183/158683
4.	Hazavehei SMM, Shirahmadi S, Taheri M, et al. Promoting oral health in 6-12 year-old students: a systematic review. J Educ Community Health 2015;1:66–84. doi: https://doi.org/10.20286/jech-010466

Records excluded on intervention (n=4)	
1.	Das A, Chellappa LR, Indiran MA. Enhancing pediatric oral health-related quality of life: a comprehensive systematic review of oral health initiatives with practical applications and global relevance. J Pioneer Med Sci 2025;14:89–97. doi: https://doi.org/10.47310/jpms202514S0112
2.	Salvatierra V, Harlyn A. Acciones de prevención y educación para la salud en la Odontología actual [Thesis]. Universidad Laica Eloy Alfaro de Manabí, Manta, Ecuador 2024. https://repositorio.ulead.edu.ec/handle/123456789/5915
3.	Saxena N, Kaurani P, Marwah N, et al. Effect of mHealth Interventions on Oral Hygiene and Oral Health Behavior in Children From Infancy to Adolescence: A Systematic Review and Meta-Analysis. Int J Paediatr Dent 2025;:1–19. doi: https://doi.org/10.1111/ipd.70052
4.	Tavakoli S, Saadatfar N, Tiyuri A. The effectiveness of school-based supervised tooth brushing intervention for preventing dental caries: a systematic review and meta-analysis. BMC Oral Health 2025;25:1967. doi: https://doi.org/10.1186/s12903-025-07299-y

Records excluded on outcome (n=2)	
1.	Alyakub SE, Aloudah AS, Alhejji AJ, et al. The impact of school-based oral health education programs on children’s oral hygiene: systematic review v1. Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/ Journal of Tianjin University Science and Technology 2025;58:217–26. doi: https://doi.org/10.5281/zenodo.16784168
2.	Noer Fadilah RP, Rikmasari R, Akbar S, et al. The impact of teledentistry on oral health promotion and prevention: a systematic review assessing its efficacy compared to conventional strategies in enhancing oral health regardless of age. J Int Dent Med Res 2024;17:1365–70.

Records excluded on population (n=1)	
1.	Rizany AK, Christabella J, Natasha N, et al. The effectiveness of education and reminder messages in increasing OHI-S, patient’s behavior, and oral health literacy in dental practice: a systematic review of randomized controlled trials. Journal of Indonesian Dental Association 2023;6:69–74. http://jurnal.pdgi.or.id/index.php/jida/article/view/952

Records excluded on study design (n=11)	
1.	Anugrah PM, Olivia M, Badruddin IA, et al. Effectiveness of smartphone application in teledentistry for enhancing parental knowledge, attitude, and practice (kap) associated with children’s oral health: a systematic review. Padjadjaran Journal of Dentistry 2024;36:400–14. doi: https://doi.org/10.24198/pjd.vol36no3.56266
2.	Castro I, Guimarães MI, Gaviña S, et al. Gamification in e-Health: strategies for oral health. Sci Letters 2025;1. doi: https://doi.org/10.48797/sl.2025.312

Records excluded on study design (n=11)	
3.	Chen H-L. Review of strategies and care provided by nursing staff to improve oral care of nursing home residents. 2022. https://skemman.is/handle/1946/40575
4.	Karlén T, Boqvist A. Kan barns kariesförekomst påverkas genom motiverande samtal med föräldrarna? : - en systematisk litteraturöversikt [can the prevalence of caries in children be affected through motivational interviewing with the parents? : a systematic literature review]. 2024. https://urn.kb.se/resolve?urn=urn:nbn:se:mau:diva-68086
5.	Kasthuri Priya K, Senthil M, Angeline D, et al. 'Effectiveness of traditional and advanced modes of health education on improving KAP & oral hygiene status among orphanage school children'- "A Systematic Review ". African Journal of Biological Sciences 2024;6. https://www.afjbs.com/uploads/paper/3a9d7893fa38f0d40902917d2e48af5b.pdf https://www.afjbs.com/issue-content/effectiveness-of-traditional-and-advanced-modes-of-health-education-on-improving-kap-oral-hygiene-status-among-orphanage-school-children-a-systematic-review-2011
6.	Murariu A, Agop Forna D, Popa. G, et al. The impact of educational interventions on oral health-promoting behaviours. RJOR 2025;17:162–72. doi: https://doi.org/10.62610/RJOR.2025.2.17.14
7.	Panda S, Mohapatra A, Jalaluddin M. Evaluating the effectiveness of school-based oral health education methods in improving children's oral health : a systematic review. Bull Stomat Maxillofac Surg 2025;21:13–20. doi: https://doi.org/10.58240/1829006X-2025.21.8-13
8.	Sanaei Nasab H, Yazdani M, Mokhayeri Y, et al. The role of psychological theories in oral health interventions: A systematic review and meta-analysis. International Journal of Dental Hygiene 2019;17:142–52. doi: https://doi.org/10.1111/idh.12386
9.	Sharma S, Mohanty V, Balappanavar AY, et al. Role of digital media in promoting oral health: a systematic review. Cureus 2022;14:e28893. doi: https://doi.org/10.7759/cureus.28893
10.	Tort S, Veninšek G. What are the benefits and harms of oral health educational interventions for nursing home staff and residents? Published Online First: 2020. doi: https://doi.org/10.1002/cca.2786
11.	Twetman S, Sveinsdóttir EG, Julihn A, et al. Er overvåget tandbørstning et effektivt tiltag til cariesforebyggelse blandt børn? Den norske tannlegeforenings Tidende 2025;135:36–40. doi:10.56373/2025-1-8

Records excluded during data extraction of supplemental search results (n=4)

Records excluded on comparator (n=1)	
1.	Menon PA, Shivakumar S, Bhambani G, et al. Effectiveness of school-based oral health education in influencing oral health among school children-systematic review and meta-analysis. J Head Neck Physicians Surg 2021;9:100. doi: https://doi.org/10.4103/jhnps.jhnps_56_21

Records excluded on non-English language (n=1)	
1.	Rogalnikovaitė K, Bendoraitienė EA, Saldūnaitė K. Burnos sveikatos mokymo įtaka paauglių burnos ertmės sveikatos klinikiniam rodikliams: sisteminė literatūros apžvalga. Visuomenės sveikata 2022;4:9–16. https://visuomenessveikata.hi.lt/uploads/pdf/visuomenes%20sveikata/2022.4(99)/VS%202022%204(99)%20LIT%20A%20Burnos%20sveikata.pdf

Records excluded on AMSTAR: inadequate Risk of Bias/Quality assessment (n=1)	
1.	Prabhu S, John J. Oral health education for improving oral health status of school children a systematic review. IOSR J Dent Med Sci 2015;14:101–6. https://iosrjournals.org/iosr-jdms/papers/Vol14-issue2/Version-8/T01428101106.pdf

Records excluded on study design (n=1)	
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1. van Nes, Karin Alexandra, van Loveren, Cor, Slot ED. Chapter 4. The effectiveness of interventions using the health action process approach in improving oral health behaviour and social cognitive constructs. A systematic review and meta-analysis. In: Involving volition: the health action process approach in paediatric dentistry [thesis]. Netherlands: Universiteit van Amsterdam 2023. 82–122.<https://pure.uva.nl/ws/files/134942228/Thesis.pdf>

Appendix D Joanna Briggs Institute Data Extraction Form for Systematic Reviews and Research Syntheses

Master extraction form

Text in red outlines additional areas we considered for data extraction. These areas are individual to each review.

Parameter	Extraction items
First author and year of publication	
Review title	
Review coding Where reviews are grouped by e.g. intervention type, participant group, etc.	
Contributing primary studies	The information presented in this extraction form applies only to the ?/X primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (i.e. <specify inclusion criteria here>).
Objectives For PICO elements, report these as set out in the Introduction/Methods only (i.e. how the reviewers conceptualised/described what they set out to look for, not details of the interventions in the specific studies the review ultimately found)	Review research question(s) and/or objectives (including page number(s)): PICO elements reported in Introduction/Methods: <ul style="list-style-type: none"> • Patient or population: • Intervention: • Comparison: • Outcome: • Setting: • Study design: • Timeframe for follow-up:
Participants The defining characteristics of the participants in studies included in the research syntheses/review should be detailed,	Number of participants: Age (mean/mode/range): Gender: Details of any additional relevant participant characteristics:

Parameter	Extraction items
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for example this may include diagnostic criteria, age, or ethnicity.
 The total number of participants that inform the outcomes relevant to the overview of reviews question from all studies included studies should be presented.

Description of Interventions/ phenomena of interest
 Clear, succinct details of the interventions or phenomena of interest featured in the included primary studies should be presented as described by systematic review author(s), including the type of intervention, the frequency, and/or intensity of the intervention.

Setting/context
 Details of the setting of interest such as acute care, primary health care, or the community or a geographical location should be included.

Databases and sources searched
 The number of sources searched should be reported. Where possible the names of databases and sources should be listed (i.e. if <5-10). The search range of each database should also be included.

Definition of intervention as per umbrella review authors (include page number):

Overview of relevant characteristics of primary studies included in systematic review:

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Additional details

Countries (no. studies) (in alphabetic order):

Setting (no. studies): e.g. schools, community

Other relevant features:

- Protocol prepared: **Yes/No**
- If published, number and link:
- Number and names of databases:
 Other non-database sources:
 Details of any other supplementary searches:
- Grey literature search: **Yes/No**
 - Reference chasing: **Yes/No**
 - Expert consultation: **Yes/No**

Parameter	Extraction items
	Search strategy/key words provided: Yes/No Time period covered by searches: Search limits (e.g. date, language): <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes/No Screening completed in duplicate: Yes/No <ul style="list-style-type: none"> • If yes, rate of agreement: Extraction completed in duplicate: Yes/No <ul style="list-style-type: none"> • If yes, rate of agreement: Funding of review: Conflicts of interest declared: If declared, how conflicts of interest were managed:
<p>Date Range (years) of included studies</p> <p>The date range spanning from the earliest study that informs the included research synthesis to the latest should be reported.</p>	<p>Date range for included studies relevant to this overview of reviews:</p> <p>Exact years of publication of studies relevant to this overview of reviews: e.g. 2021 (3 studies), 2022 (5 studies)</p>
<p>Number of primary studies included in the systematic review</p> <p>Summary descriptive details of the included studies in the research synthesis should be reported. This includes the number of studies in the included research synthesis, the types of study designs included in the research synthesis (e.g. RCT, prospective cohort study, ethnography etc.).</p> <p>Whether information on funding and conflicts of interest were reported by primary study authors should also be included. Additional detail on funding sources of primary studies may be advisable if known vested interests exist in this area.</p>	<p>Number of primary studies:</p> <p>Number of studies by study design:</p> <p>Funding of primary studies: Yes/No</p> <p>Conflicts of interest of primary studies: Yes/No</p>
<p>Types of studies included</p>	<p>Planned study design(s) to be included:</p> <p>Reasons for including study design(s) provided? Yes/No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s):

Parameter	Extraction items
	<p>List of excluded studies at full text provided? Yes/No</p> <p>Reasons for exclusion provided? Yes/No</p>
<p>Appraisal instruments used</p> <p>The instrument or tool used to assess risk of bias, rigour or study quality should be reported.</p>	<p>Full name of tool(s) used:</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes/No • Blinding of assessors: Yes/No • Sequence allocation (individual vs group randomisation): Yes/No • Selective reporting: Yes/No <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Confounding: Yes/No • Selection bias: Yes/No • Exposure and outcomes: Yes/No • Selective reporting: Yes/No
<p>Appraisal ratings</p> <p>An overview of appraisal ratings assigned by the appraisal instrument should be reported here. Additional information outlining primary study authors approach to dealing with mixed appraisal ratings should be included here</p>	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>OR</p> <p>The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have a high risk of bias (k=X), unclear risk of bias (k=x) and low risk of bias (k=x)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: Yes/No • Only low risk of bias RCTs included in meta-analysis: Yes/No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes/No

Parameter	Extraction items																		
<p>Method of analysis The type of research synthesis as stated by the authors of the included review should be detailed. For example, this may include narrative synthesis, vote counting, random effects meta-analysis, fixed effect meta-analysis, network meta-analysis, thematic synthesis, meta- aggregative synthesis, or meta-ethnography.</p>	<p>Assessment of publication bias: Yes/No</p> <ul style="list-style-type: none"> If yes, how was publication bias assessed? If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): <p>Authors description of method of analysis (include page number):</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> If meta-analysis was conducted, authors' justification for combining data in meta-analysis: Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes/No <p>For prospective cohort studies:</p> <ul style="list-style-type: none"> Statistical combination of data adjusted for confounding (not raw data): Yes/No Authors' justification for combination of raw data where adjusted estimates were not available (include page number): Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes/No 																		
<p>Outcomes assessed Included here should be the outcomes of interest to the overview of review question(s) reported on by the research synthesis, i.e. the names or labels of the outcomes (see below for presentation of results).</p>	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> Primary outcome 1 Primary outcome 2 etc... <p>List of authors' secondary outcomes:</p> <ul style="list-style-type: none"> not applicable 																		
<p>Results/findings The relevant findings or results presented by the included research syntheses must be extracted. For quantitative reviews, this will ideally be an effect estimate with 95% Cis or measure from a presented meta- analysis. Measures of heterogeneity should also be extracted where applicable.</p>	<p>META-ANALYSIS FINDINGS</p> <p>Primary outcomes</p> <table border="1"> <thead> <tr> <th>Outcome</th> <th>Intervention vs. comparator</th> <th>Measure</th> <th>Primary studies contributing to analysis</th> <th>Summary estimate</th> <th>P-value</th> <th>I² (%)</th> <th>Results (Direction of effect, n, effect estimate, 95%</th> <th>Additional</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	P-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95%	Additional									
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Parameter	Extraction items							
								CI, p value, heterogeneity

Secondary outcomes **Not applicable**

NARRATIVE SYNTHESIS

Primary outcomes

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional

Secondary outcomes **Not applicable**

Separate summaries reported for RCTs and non-randomised studies when included in the same review?

Yes/No

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

Causes of heterogeneity investigated? **Yes/No**

- If yes, describe methods (e.g. subgroup/sensitivity analysis)

Heterogeneity

Parameter	Extraction items
	<ul style="list-style-type: none"> If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	
<p>There should be provision to extract and present in the table of included study characteristics any relevant details or comments on the included research synthesis by the authors of the overview of reviews. These comments may be relevant details regarding the included research synthesis, for example, the congruence between the review results and conclusions, and for highlighting any potential methodological differences between the individual included reviews.</p>	

Abuhaloob *et al.* (2019) – Extraction form

Parameter	Extraction items
First author and year of publication	Abuhaloob <i>et al.</i> (2019)
Review title	Maternal and child oral health interventions in Middle East and North Africa regions: a rapid review
Review coding	Maternal and child:
Contributing primary studies	<p>The information presented in this extraction form applies to 2/4 primary studies included and relates to research question 3 in the systematic review deemed relevant to the purposes of the current overview of reviews.</p> <p>Research Q1, Q2 and Q4 address what interventions have been implemented and whether integrated into ongoing programmes, neither addressing the focus of the current overview.</p>
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): This study aimed to conduct a rapid review of the literature to identify any maternal and/or child oral health interventions implemented and/or tested in MENA countries, with particular focus upon Lebanon, Palestine and Syria, to compile information on the relative effectiveness of these interventions. (P411)</p> <p>The research question relevant to the current overview:</p>

Parameter	Extraction items																
	<p>Research Q3: Are there any systematic reviews or randomised controlled trials assessing the effectiveness of maternal and/or child oral health intervention in MENA countries and, if so, what are the most effective interventions?</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Mothers and/or children under 5 years old • Intervention: Oral health intervention and/or systematic reviews for oral health intervention. • Comparison: Control • Outcome: Change in incidence and/or prevalence of oral and dental diseases among mothers and/or children under 5 years old; and change in personal skills, strengthen community actions, reorienting health services, building healthy public policy, and creating supportive environments to improve or promote oral health. • Setting: living in MENA countries. • Study design: Oral health intervention and/or systematic reviews for oral health intervention. • Timeframe for follow-up: Not specified <p>Number of participants: 332 pairs of mother and child</p> <p>Age (mean/mode/range): Age of mothers not reported. Children < 5 years old. Range 12 months to 5 years</p> <p>Gender: children gender not reported; Mothers - female</p> <p>Details of any additional relevant participant characteristics:</p>																
<p>Participants</p> <p>Description of Interventions/ phenomena of interest</p>	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Providers</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Mohebbi 2009 Tehran, Iran Trial integrated</td> <td>Cluster randomised trial</td> <td>242 mothers and children (12–15 months) pairs</td> <td>Vaccination staff</td> <td>Intervention A (n = 77) • pamphlet • 5 min of oral health instructions</td> <td>Control (n = 80) • no oral health information</td> <td>6 months</td> <td>• Increase in mean decayed enamel (de) increment in control and intervention B</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Providers	Intervention	Comparator	Duration	Outcomes of interest	Mohebbi 2009 Tehran, Iran Trial integrated	Cluster randomised trial	242 mothers and children (12–15 months) pairs	Vaccination staff	Intervention A (n = 77) • pamphlet • 5 min of oral health instructions	Control (n = 80) • no oral health information	6 months	• Increase in mean decayed enamel (de) increment in control and intervention B
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Parameter	Extraction items							
	into ongoing vaccination programme				<ul style="list-style-type: none"> • phoned twice as reminded <p>Intervention B (n = 85)</p> <ul style="list-style-type: none"> • no verbal oral health instructions • reminder phone calls were provided 			<p>groups with no new de appeared in intervention group A</p> <ul style="list-style-type: none"> • Increase percentages of children developing new de in control and intervention B • de of intervention group A reduced from 0.25 to 0.0 and percentage of children having dental caries in the same group reduced from 13% to 7% • No differences in decayed teeth (dt) increments
	Makvandi 2015 Hamadan, Iran	Cluster randomised control trial	90 mothers and children (1–2 years)	Primary care staff	(n = 40 mothers): • 3 oral health sessions	Control (n = 41 mothers): • no intervention	3 months	At 10 days and 3 months assessment,

Parameter	Extraction items								
	Intervention in 5 day-care centres					<ul style="list-style-type: none"> • Booklet • SMS reminder 			<p style="color: red;">improvement in all cognitions in intervention group was:</p> <ul style="list-style-type: none"> • Significant in (knowledge, attitude, perceived behavioural and) cleaning of children's teeth.

Countries (no. studies) (in alphabetic order):

Setting/context

Iran (2 cRCT Makvandi 2015, Mohebbi 2009)

Setting (no. studies): integrated into vaccine programme (1 study); day-care centres (1 study)

Other relevant features: n/a

Databases and sources searched

Protocol prepared: Not reported

- **If published, number and link:**

Number and names of databases:

- 5 databases: Cochrane library, MEDLINE, Web of knowledge, CINAHL, Education Resources Information Center (ERIC)

Other non-database sources:

- websites of
 - WHO,
 - the International Union for Health Promotion and Education (IUHPE),
 - the United Nations Children's Fund (UNICEF),
 - United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)
 - the United Nations Refugee Agency (UNHCR).

Details of any other supplementary searches:

- **Grey literature search:** Yes

Parameter	Extraction items
	<ul style="list-style-type: none"> • Reference chasing: No • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: Not reported</p> <p>Search limits (e.g. date, language): No limitations applied</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? N/A <p>Screening completed in duplicate: Yes. All screening stages were conducted by two independent reviewers</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported <p>Extraction completed in duplicate: Yes. One reviewer extracted the data, and the second reviewer double-checked the extractions by the first reviewer.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: This review had no external funding.</p> <p>Conflicts of interest declared: The authors declare that there are no conflicts of interest. If declared, how conflicts of interest were managed: N/A</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: 2009 – 2015</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2009 (1 study), 2015 (1 study)</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 2 studies (of 4 primary studies)</p> <p>Number of studies by study design: 2 cRCT Mohebbi 2009, Makvandi 2015,</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p>
Types of studies included	<p>Planned study design(s) to be included: The review authors planned to include studies of oral health intervention and/or systematic reviews for oral health intervention</p>

Parameter	Extraction items
	<p>Reasons for including study design(s) provided? No. No specific reasons identified</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): N/A <p>List of excluded studies at full text provided? No information provided</p> <p>Reasons for exclusion provided? Yes (<i>n</i> = 26) in PRISMA flow chart</p> <p>1- Not mother and/or child oral health intervention or reviews, <i>N</i> = 21</p> <p>2- Not conducted in Middle East and/or North Africa regions, <i>N</i> = 4</p> <p>3- Not reported outcome related to oral and dental health, <i>N</i> = 1</p>
Appraisal instruments used	<p>Full name of tool(s) used:</p> <p>The quality of randomised control trials was assessed using the 25-item checklist stated in CONSORT guidelines (2010), while the quality of non-randomised control trials was assessed by the Newcastle Ottawa Scale. 2 studies were deemed to have shown high methodological quality (Mohebbi 2009, Makvandi 2015) and met most of the CONSORT guidelines.</p> <p>Assessment for risk of bias was conducted independently by two reviewers for included interventions based on the criteria identified in the Cochrane Handbook for Systematic Reviews of Interventions.</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> N/A</p> <ul style="list-style-type: none"> •
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have a high risk of</p>

Parameter	Extraction items
	<p>bias Makvandi 2015) or low risk of bias (k=1 Mohebbi 2009) except in relation to blinding of participants and personnel (high risk of bias in all studies)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): The potential risk of bias was low in the included studies, except for performance bias. In four of the interventions, participants were not blinded, because of the nature of the interventions. (page 414)</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: Yes as assessed by authors • Only low risk of bias RCTs included in meta-analysis: N/A no meta-analysis performed • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? N/A <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Not specifically reported • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): Not reported
Method of analysis	<p>Authors description of method of analysis (include page number): A synthesis of study data pertinent to each of the review questions was performed. The synthesis included the categorisation of relevant study findings.</p> <p>Authors' justification for narrative synthesis or meta-analysis: No attempt was made to perform meta-analysis for two reasons: (i) the review was not initially designed to perform such an analysis; (ii) the trials included in this review were heterogeneous with regard to population, intervention and comparator. (page 412)</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: N/A • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? N/A • For prospective cohort studies: N/A

Parameter	Extraction items
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Outcomes assessed

List of authors’ primary outcomes: Outcomes of interest relate to research Q3. In order to investigate the effectiveness of included interventions, the review evaluated interventions against the WHO recommendations and guidelines for evaluation of effectiveness of oral health interventions.

- Primary outcome 1: Change in incidence and/or prevalence of oral and dental diseases.
- Primary outcome 2: Change in personal skills, creating supportive environments to improve or promote oral health.

List of authors’ secondary outcomes: N/A

Results/findings

META-ANALYSIS FINDINGS

No meta-analysis performed

Primary outcomes

NARRATIVE SYNTHESIS

Primary outcomes

The 2 randomised trials reported significant improvement in infants’ and 1–2-year-old children’s oral health when incorporating child oral health promotion programmes into ongoing government vaccination programmes and childcare centres. Review authors noted that these interventions showed significant reduction in early dental caries risks, and significant (P = 0.001) improvement in mothers’ oral health knowledge, attitude, perceived behavioural, and cleaning of children’s teeth (Mohebbi 2009, Makvandi 2015). These interventions illustrated the importance of using integrated approaches during pregnancy and to continue to support behaviour change throughout the infants’ first few years. Makvandi (2015) emphasised the effective role of phone text reminders on enhancing the positive outcome and improving mothers’ cognitions and cleaning of children’s teeth.

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
improvement in infants’ and 1–2-year-old childrens’ oral health when	Information +/- instruction, provision of baby toothpaste	decayed enamel (de) increment; decayed teeth	Mohebbi 2009	no new decayed enamel (de) and decrease (from 0.25 to 0.0) in		1 randomised trial (n=242) reported significant reduction in early dental caries risks. Increase percentages of children developing	

Parameter	Extraction items							
	incorporating child oral health promotion programmes into ongoing government vaccination programmes and childcare centres.	+ reminders vs No intervention or information only	(dt) increments		intervention A; Increase (P < 0.05) in mean de in control (0.4) and intervention B (0.2); no difference in dt		new de were 0% (A), 26% (control), and 14% (B) Percentage of children having dental caries in the A group reduced from 13% to 7% No differences in decayed teeth (dt) increments	
	improvement in mothers' oral health knowledge, attitude, perceived behavioural, and cleaning of children's teeth	3 Oral health sessions, a booklet, SMS reminders or no intervention	Assessment of cognitions	Makvandi 2015	Not specified	(p=0.001)	1 cRCT (n=90) reported significant improvement in cleaning children's teeth	

Separate summaries reported for RCTs and non-randomised studies when included in the same review? N/A

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

The trials included in this review were heterogeneous with regard to population, intervention and comparator, therefore no meta-analysis was considered.

Heterogeneity

Causes of heterogeneity investigated? No

- If yes, describe methods (e.g. subgroup/sensitivity analysis)

Parameter	Extraction items
	<ul style="list-style-type: none"> If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	Review authors noted “The main limitation of the current review is that there are few studies investigating the impact of incorporating oral health preventive interventions into ongoing WHO or government maternal and/or child health programmes in countries of the MENA region and showing significant improvement in mothers’ cognitions and cleaning of children’s teeth. Thus, evidence of the effectiveness of such interventions is not available and needs further investigation.”

Albrecht *et al.* (2016) – Extraction form

Parameter	Extraction items
First author and year of publication	Albrecht <i>et al.</i> (2016)
Review title	Oral health educational interventions for nursing home staff and residents
Review coding	Nursing home staff and residents; Mixed providers of interventions
Contributing primary studies	The information presented in this extraction form applies to all of the 9/9 primary studies included in the systematic review as deemed relevant to the purposes of the current overview of reviews
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): To assess the effects of oral health educational interventions for nursing home staff or residents, or both, to maintain or improve residents’ oral health. To describe the components of the complex interventions used in the included studies. (p6)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> Patient or population: <ul style="list-style-type: none"> male and female residents living in facilities providing supervision or nursing care for the elderly (e.g. nursing homes or long-term care facilities) for inclusion. nursing staff working in these facilities or a combination of residents and nursing staff. all participants involved in the primary studies (i.e. irrespective of residents' oral health status or qualifications of the nursing staff). The majority of residents in a study had to be over the age of 64 years, or the mean age had to be at least 65 years

Parameter	Extraction items																
<p>Participants</p>	<ul style="list-style-type: none"> • Intervention: Oral health education programmes include either direct-to-staff programmes, direct-to-resident programmes (e.g. oral hygiene promotion or skills training), or a combination of both. • Comparison: usual care • Outcome: Dental Caries; Quality of Life; Dental Plaque; Gingivitis • Setting: nursing homes or long-term care facilities • Study design: RCTs or cluster-RCTs • Timeframe for follow-up: at least 2 weeks <p>Number of participants: 3253 nursing home residents Age (mean/mode/range): from 78 to 86 years across studies Gender: more than 66% women in all studies; Details of any additional relevant participant characteristics: In five studies, the target groups of the educational interventions were nursing home staff (De Visschere 2011; De Visschere 2012; Frenkel 2001; MacEntee 2007; Van der Putten 2013) - solely nursing staff or managerial and nursing staff. In four studies both nursing home staff and residents were included (Bellomo 2005; Mojon 1998; Schou 1989; Zenthöfer 2013).</p>																
<p>Description of Interventions/ phenomena of interest</p>	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Providers</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Bellomo 2005_ Switzerland residents of the long-term care home (irrespective of state of (oral) health)</td> <td>RCT</td> <td>61 long-term care home residents</td> <td>occupational therapy instruction</td> <td>Instruction/skills training 2 groups: • tooth and denture brushing • tooth and denture brushing followed by weekly monitoring</td> <td>2 training subgroups • usual care • weekly occupational therapy employing "placebo"</td> <td>Study period: Not reported Planned follow-up period: 6 months</td> <td>Outcomes: Oral hygiene measures, level of autonomy (brushing), and residents'</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Providers	Intervention	Comparator	Duration	Outcomes of interest	Bellomo 2005_ Switzerland residents of the long-term care home (irrespective of state of (oral) health)	RCT	61 long-term care home residents	occupational therapy instruction	Instruction/skills training 2 groups: • tooth and denture brushing • tooth and denture brushing followed by weekly monitoring	2 training subgroups • usual care • weekly occupational therapy employing "placebo"	Study period: Not reported Planned follow-up period: 6 months	Outcomes: Oral hygiene measures, level of autonomy (brushing), and residents'
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Parameter	Extraction items							
					<p>and if necessary re-education.</p> <p>Education: Educational lecture for medical/nursing staff of the long-term care home (aiming to raise awareness of dental hygiene needs of the residents, motivation to support the study)</p>	<p>interventions, e.g. a manicure</p> <p>Education: Educational lecture for medical/nursing staff of the long-term care home (aiming to raise awareness of dental hygiene needs of the residents, motivation to support the study)</p>		<p>oral health-related behaviour were assessed at baseline, 3 and 6 months after start of the study</p>
	<p>De Visschere 2011_ Belgium (Flanders) all residents eligible in 12 nursing homes</p>	<p>Cluster - randomised controlled trial, 3 arms</p>	<p>1393</p>	<p>Trained nursing staff - Oral health coordinators educated nursing staff</p>	<p>Implementation of an oral hygiene protocol including multiple components: Education/skills training: • theoretical and practical training session (half day) for all oral health</p>	<p>CG1: usual oral hygiene CG2: complex intervention was implemented in the nursing home, but residents did not receive intervention</p>	<p>Study period: Not reported Planned follow-up period: 5 years</p>	<p>Oral hygiene measures were assessed at baseline, and every year after the start of the study for a period of 5 years.</p>

Parameter	Extraction items							
					<p>co-ordinators, who had to educate the other nursing staff (train-the-trainer principle)</p> <ul style="list-style-type: none"> • introduction session • appointment of registered nurses as oral health co-ordinators • oral assessment of new residents • preparation of an "individualized oral hygiene plan" for every resident 			
	<p>De Visschere 2012_ Belgium (Flanders) 12 nursing homes</p>	<p>Cluster - randomised controlled trial, 2 arms</p>	<p>373 nursing home residents; 760 nursing staff</p>	<p>Trained nursing staff - ward oral healthcare organiser supervised and educated nurses and nurse assistants. monitoring visits and</p>	<p>Supervised implementation of the "Oral health care Guideline for Older people in Long-term care Institutions (OGOLI)" including multiple components: Education/skills training:</p> <ul style="list-style-type: none"> • oral presentation (1.5 hours) for staff 	<p>Usual oral health care according to the no-supervised implemented guideline. The intervention was implemented in the control nursing homes after</p>	<p>Study period: Not reported Planned follow-up period: 6 months</p>	<p>Oral hygiene measures were assessed at baseline and 6 months after the start of the study.</p>

Parameter	Extraction items							
				support of a dental hygienist.	<ul style="list-style-type: none"> • lecture (2 hours) • practical education (1 hour) for the ward oral healthcare organisers according to the train-the-trainer concept • theoretical and practical education session (1.5 hour) for all nurses and nurse assistants. Oral healthcare material and products	completion of data collection.		
	Frenkel 2001_UK Target audience for intervention: nursing staff Inclusion: residents who either wore dentures and/or had one or more natural teeth, and whose general health permitted oral	Cluster - randomised controlled trial, 2 arms	412 nursing home residents; 322 nursing staff	Health promoters provided oral healthcare education and skills training for care assistants	Education/skills training: <ul style="list-style-type: none"> • oral healthcare education session (1 hour) for the care assistants including a theoretical section (role of plaque in oral diseases, demonstration of cleaning techniques) and a 	Usual care (health education programme was delivered after completion of data collection)	Study period: not reported Planned follow-up period: 6 months	Oral hygiene measures were assessed at baseline, 1 month and 6 months after education.

Parameter	Extraction items							
	examination to take place				practical section (cleaning techniques for natural teeth and dentures using a manikin head, models, and other teaching aids)			
	MacEntee 2007_Canada 14 long-term care facilities Target audience for intervention: care-aides	Cluster - randomised controlled trial, 2 arms	127 nursing home residents with intermediate care	Dental hygienist. Nurse educator managing oral health care	Pyramidal education consisting of: Education/skills training: <ul style="list-style-type: none"> nurse educator training for a permanent member of the nursing staff by a dental hygienist single seminar (1 hour) for care-aides conducted by the nurse educator 	Usual routine (comprises the same 1-hour seminar but delivered directly to the care-aides by the dental hygienist.	Study period: not reported Planned follow-up: 3 months	Oral hygiene measures were assessed at baseline and 3 months after the seminar.
	Mojon 1998_Switzerland Target audience for intervention: nursing staff (nurses and nurse aides) and residents	Cluster - randomised controlled trial, 2 arms	237 nursing home residents	Nurse/nurses aide received personalised oral hygiene instructions for	Education/skills training: <ul style="list-style-type: none"> interactive lecture (45 minutes) on oral health prevention and demonstration on how to 	Usual care (prior to the study no oral hygiene care was provided by the caregivers on a regular basis)	Study period: not reported Planned follow-up period: 18 months	Oral hygiene measures and infections were assessed at baseline

Parameter	Extraction items							
				residents from dental hygienist	brush teeth for nurses and nurse aides <ul style="list-style-type: none"> • brief oral hygiene instruction for the residents by a dental hygienist • instructions (personalised for every resident) given by a dental hygienist for the accompanying nurse or nurse aide 			and 18 months later.
	<p>Schou 1989_Scotland 4 institutions for the elderly Target audience for the intervention: nursing staff or residents, or both</p>	Cluster - randomised controlled trial, 4 arms	201 residents	Dental hygienists	3 groups with a dental health education programme targeted at different audiences Education: <ul style="list-style-type: none"> • Sessions on dental health with the active involvement principle (3 times, 1 hour, monthly interval) 	Usual care (no educational programme)	Study period: January 1985 to September 1985 Planned follow-up period: 9 months	Oral hygiene measures and oral health-related behaviour were assessed at baseline and 2 months after termination of the programme

Parameter	Extraction items							
					conducted by dental hygienists for residents only (IG1), staff only (IG2), or staff and residents (IG3)			(9 months after the start).
	Van der Putten 2013_Netherlands 12 nursing homes Target audience: nursing home staff	Cluster - randomised controlled trial, 2 arms	343 nursing home residents	Trained nursing staff - ward oral healthcare organiser supervised and educated according to train-the-trainer concept	Supervised implementation of the "Oral health care Guideline for Older people in Long-term care Institutions (OGOLI)" including multiple components: Education/skills training: <ul style="list-style-type: none"> • oral presentation (1.5 hours) for staff • lecture (2 hours) • practical education (1 hour) for the ward oral healthcare organisers according to the train-the-trainer concept • theoretical and practical education 	Usual oral health care according to the no-supervised implemented guideline	Study period: not reported Planned follow-up period: 6 months	Oral hygiene measures were assessed at baseline and 6 months after the start of the study.

Parameter	Extraction items							
					session (1.5 hour) for all nurses and nurse assistants.			
	Zenthöfer 2013_Germany 8 institutions for elderly people Target audience: nursing home residents and caregiver staff	Rando mised control led trial, 4 arms	106 nursing home residents	Dentist provided education, instruction and reinstructi on and remotivati on	3 groups with multiple interventions: Education/instructi on: <ul style="list-style-type: none"> • individual instructions for every resident in the specifics of his/her oral hygiene including brushing techniques and cleaning auxiliaries (minimum of half an hour) • one 2-hour lesson for caregivers (including a PowerPoint presentation, an oral hygiene film, and dental demonstration models); oral hygiene instructions were given according to a 	Usual oral hygiene	Study period: not reported Planned follow-up period: 12 weeks (re- evaluation after 3 years for IG)	Oral hygiene measures were assessed at baseline and 2 weeks, 6 weeks, 12 weeks, and 3 years after the interventio n

Parameter	Extraction items							
					standardised scheme Additional interventions: <ul style="list-style-type: none"> • IG1: no remotivation for residents (over the 12-week study period) • IG2: remotivation for residents by dentist (re-instruction and remotivation after 4 and 8 weeks) • IG3: remotivation for residents by caregivers (provision of help twice a week using a standardised procedure) 			

Countries (no. studies) (in alphabetic order):

Setting/context

Belgium (2 cRCT De Visschere 2011, 2012)

Canada (1 cRCT MacEntee 2007)

Germany (1 RCT Zenthofer 2013)

Parameter	Extraction items
	<p>Netherlands (1 cRCT Van der Putten 2013)</p> <p>Scotland (1 cRCT Schou 1989)</p> <p>Switzerland (1 RCT Bellomo 2005, 1 cRCT Mojon 1998)</p> <p>UK (1 cRCT Frenkel 2001)</p> <p>Setting (no. studies):</p> <p>All studies were based in nursing homes;</p> <p>Longterm care home/facility; Nursing homes; institutions for the elderly</p> <p>Other relevant features: n/a</p>
Databases and sources searched	<p>Protocol prepared: Yes</p> <p>If published, number and link: The protocol was prepared but the review authors did not provide a link to the protocol. Published on Cochrane Library. Differences between the protocol and published review are noted.</p> <p>Number and names of databases:</p> <ul style="list-style-type: none"> • 6 databases <ul style="list-style-type: none"> • Cochrane Oral Health Trials Register (to 18 January 2016) • Cochrane Central Register of Controlled Trials (18 January 2016) • MEDLINE Ovid (1946 to 18 January 2016) • Embase Ovid (1980 to 18 January 2016) • CINAHL EBSCO (1937 to 18 January 2016) • Web of Science Conference Proceedings (1990 to 18 January 2016) • Other sources <ul style="list-style-type: none"> • US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov • World Health Organization International Clinical Trials Registry Platform

Parameter	Extraction items
	<p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: Yes. Reference lists of published reviews and contacted experts in the field to identify unpublished or ongoing studies. • Expert consultation: Yes <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: to January 2016</p> <p>Search limits (e.g. date, language): No restrictions on language or date of publication when searching the electronic databases.</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>The two review authors resolved disagreements by discussion or, if necessary, by consulting a third review author in order to reach consensus.</p> <p>Funding of review:</p> <p>The review was supported by funding from the National Institute for Health Research (NIHR) and the Cochrane Oral Health Group Global Alliance partners.</p> <p>Conflicts of interest declared:</p> <p>No conflicts of interest were declared</p> <p>If declared, how conflicts of interest were managed:</p>
<p>Date Range (years) of included studies</p>	<p>Date range for included studies relevant to this overview of reviews: Trials were published between 1989 - 2013</p> <p>Exact years of publication of studies relevant to this overview of reviews: 1989 (1 study), 1998 (1 study), 2001 (1 study), 2005 (1 study), 2007 (1 study), 2011 (1 study), 2012 (1 study), 2013 (2 studies)</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 9 studies</p>

Parameter	Extraction items
	<p>Number of studies by study design: 2 individual RCTs (Bellomo 2005 and Zenthöfer 2013) 7 cluster RCTs (De Visschere 2011; De Visschere 2012; Frenkel 2001; MacEntee 2007; Mojon 1998; Schou 1989; Van der Putten 2013)</p> <p>Funding of primary studies: Yes.</p> <p>All but two studies stated information about any kind of funding (Bellomo 2005; Schou 1989).</p> <p>Funding was obtained from a commercial source for data collection (De Visschere 2011), free oral healthcare material (Zenthöfer 2013); 2 studies received grants from non-commercial sources (Frenkel 2001; MacEntee 2007), 3 studies received grants from non-commercial sources as well as free oral hygiene products from commercial sources (De Visschere 2012; Mojon 1998; Van der Putte n 2013).</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: RCTs or cluster-RCTs with a follow-up period of at least two weeks, publications on development and piloting of complex interventions as well as process evaluations</p> <p>Reasons for including study design(s) provided? Not reported. No specific reasons identified</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): n/a <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes</p> <p>18 studies excluded – 7 not RCTs, 6 not education programme, 3 not elderly, 1 no predefined outcome measures, 1 not nursing home based</p>
Types of studies included	
Appraisal instruments used	<p>Full name of tool(s) used: Assessment of risk of bias followed the guidance in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2011).</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes

Parameter	Extraction items
Appraisal ratings	<p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: N/A</u></p> <ul style="list-style-type: none"> • <p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality): Two review authors independently assessed and scored studies.</p> <p>No study showed overall low risk of bias.</p> <p>High risk of bias (low quality) (4 studies), (Bellomo 2005; De Visschere 2011; De Visschere 2012; Mojon 1998).</p> <p>Unclear/moderate risk of bias (unclear/moderate quality) (5 studies), (Frenkel 2001; MacEntee 2007; Schou 1989; Van der Putte n 2013; Zenthöfer 2013).</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): A judgement concerning the related risk of bias for each domain, either 'low risk', 'high risk', or where insufficient information was available to make a judgement, 'unclear risk' was assigned. Authors judged all nine studies to be at low risk of performance bias (blinding of participants/personnel), considered the influence of residents' and staff awareness on oral health behaviour to be negligible. As 7 of the trials were cRCTs other potential sources of bias such as recruitment bias in cRCTs or contamination were assessed.</p>
	<ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Review authors contacted authors of all primary studies to provide further information on methodological details. Protocols or trial registrations were checked. • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): In order to minimise the risk of publication bias comprehensive searches in multiple databases including unpublished studies were performed. Due to the small number of included trials, authors did not use a funnel plot to assess the likelihood of publication bias. (page 8)

Parameter	Extraction items
Method of analysis	<p>Authors description of method of analysis (include page number): For each study authors considered whether groups of individuals were randomised in clusters or individually, whether individuals underwent more than one intervention, and whether there were multiple observation times for the same outcome - subgroup analyses for studies with short-term and long-term follow-up only using the longest. For cRCTs authors checked whether results were cluster-adjusted.(page 8)</p> <p>Review authors grouped studies according to interventions.</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: <p>For combined meta-analyses of individual and cluster-RCTs, authors estimated 'effective sample sizes' using intraclass correlation coefficients (ICC); Where no ICCs were reported or values seemed unrealistically high, a conservative estimate of ICC = 0.05 based on experience from previous studies on caries was considered.</p> <ul style="list-style-type: none"> • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. Authors assessed heterogeneity statistically and quantified it among trials included in each analysis using the I² statistic. For continuous data (e.g. plaque indices), authors used the mean difference (MD) and its corresponding 95% confidence interval (CI) if the same instrument was used, or the standardised mean difference (SMD) if different instruments were used for the same outcome measure. For dichotomous data (e.g. incidence of respiratory disease), authors used risk ratio (RR). Authors sought and recorded the absolute numbers in each group and the numbers experiencing the outcome of interest. <p>For prospective cohort studies: N/A</p> <ul style="list-style-type: none"> •
Outcomes assessed	<p>List of authors' primary outcomes: Oral health-related quality of life; Oral health; Dental health;</p> <p>Primary outcome 1 and 2: None of the trials assessed the predefined primary outcomes 'oral health' and 'oral health-related quality of life'.</p> <ul style="list-style-type: none"> • Primary outcome 3: Dental health <ul style="list-style-type: none"> ○ Dental and denture plaque, or both ○ Gingivitis or denture-induced stomatitis ○ Caries, incidence of new caries <p>Summary of findings tables for primary outcomes 3 were provided.</p>

Parameter	Extraction items
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List of authors' secondary outcomes: N/A only primary outcomes (as defined by systematic review authors) of any measurable indicators of oral health are of interest to this overview.

META-ANALYSIS FINDINGS

Primary outcome – Comparison 1: Educational intervention (with information and practical components) versus (optimised) usual care

LOW GRADE certainty reported for all outcomes in meta-analyses. Random-effects models used for all analyses.

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Oral health-related quality of life							Outcome not reported	
Oral health							Outcome not reported	
Dental health – Dental plaque Follow-up: 3 to 60 months	Oral health education versus usual care	Plaque Index, Oral Hygiene Index, Geriatric Simplified Debris Index (all scales scoring 0 to 3)	6 studies (Bellomo 2005; De Visschere 2011; De Visschere 2012; Frenkel 2001; MacEntee 2007; Van der Putten	MD 0.04 lower, (95% CI - 0.26 to +0.17)	P = 0.71	65.53 %	Dental plaque scores did not differ between residents who were cared for by nursing staff educated in oral health and those receiving usual care. Information from 2 further studies was not available for meta-analysis. A lower score indicates less plaque	LOW GRADE

Parameter	Extraction items							
				2013) 3 studies at high and 3 at unclear risk of bias				
Dental health – Denture plaque Follow-up: 3 to 60 months	Oral health education versus usual care	Denture Plaque Index (scoring 0 to 3) and method of Augsburg er (scoring 0 to 4)	5 studies (Bellomo 2005; De Visschere 2011; De Visschere 2012; Frenkel 2001; Van der Putten 2013). 3 studies were at high risk of bias and two were at unclear risk of bias.	SMD 0.60 lower, (95% CI 1.25 lower to 0.05 higher)	P = 0.07	92.04 %	Denture plaque scores were not lower for residents who were cared for by nursing staff educated in oral health compared to residents receiving usual care	LOW GRADE Different outcome scales used

NARRATIVE SYNTHESIS

Primary outcomes – Comparison 1: Educational intervention (with information and practical components) versus (optimised) usual care

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional

Parameter	Extraction items							
	Gingivitis Follow-up: 3 to 6 months	Oral health education versus usual care	Gingival Bleeding Index and method of Suomi	3 studies (Frenkel 2001; MacEntee 2007; Zenthöfer 2013;)			No meta-analysis (data not comparable) 3 studies at unclear risk of bias showed inconsistent results. Frenkel 2001 showed a statistically significant difference in mean gingivitis score in favour of the intervention group (adjusted MD -0.28, 95% CI -0.42 to -0.15; P < 0.001). MacEntee 2007 showed no significantly different scores for gingivitis between intervention and control (MD -0.2, 95% CI -7.3 to 7.0; P = 0.48). Zenthöfer 2013 showed the mean values for the Gingival Bleeding Index were lower in intervention groups 1 (8.5, standard deviation (SD) 11.9), 2 (7.4, SD 8.7), and 3 (20.7, SD 23.9) compared to the control group (21.8, SD 27.5) (P values not reported/not calculated).	LOW GRADE
	Denture-induced stomatitis Follow-up: 6 to 18 months	Oral health education versus usual care	Method of Budtz-Jørgensen	3 studies (Frenkel 2001; Mojon 1998)			No meta-analysis (data not comparable) 2 studies at unclear risk or high risk of bias showed no apparent differences at short-term or long-term follow-up	LOW GRADE

Parameter	Extraction items							
	Caries/rot caries Follow-up: 6 to 18 months	Oral health education versus usual care		2 studies (Frenkel 2001; Mojon 1998)			No meta-analysis (data not comparable) 2 studies at unclear or high risk of bias showed no apparent differences at short-term or long-term follow-up	LOW GRADE

Primary outcomes – Comparison 2: Educational intervention (information only) versus usual care

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Denture plaque (n=112) Denture stomatitis (n=114)	Oral health education versus usual care		1 study only (Schou 1989)			showed insufficient evidence to determine whether or not denture plaque scores are lower when educating residents or nursing staff without practical training. No difference in the prevalence of denture stomatitis between the groups.	

Separate summaries reported for RCTs and non-randomised studies when included in the same review? N/A

Heterogeneity

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

Authors considered 'Risk of bias' issues in conjunction with the fact that meta-analyses showed statistically significant heterogeneity ($I^2 = 60\%$ and 92%).

Parameter	Extraction items
	<p>They downgraded the evidence due to serious risk of bias and inconsistency, which resulted in rating the evidence as low quality for all assessed outcomes. Review authors commented on heterogeneity relating to the duration of interventions on the impact on dental health outcomes, the intensity, the complex components of interventions and mode of delivery.</p> <p>Causes of heterogeneity investigated? Yes</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) Review authors assessed heterogeneity statistically and quantified it among trials included in each analysis using the I² statistic. • If yes, provide a brief indication of the extent of heterogeneity in the relevant results: Statistically significant heterogeneity (I² = 60% and 92%).
Comments	<p>The quality of the evidence included in comparison 1 limits the confidence with which the review authors could draw conclusions about the efficacy of educational interventions on oral health of nursing home residents.</p> <p>Educators delivering the intervention were from a range of professional backgrounds (dentists, dental hygienists, trained nursing staff, health promoters). In most studies, the educators were not members of the established nursing staff, except nurses who were trained as oral healthcare co-ordinators.</p>

Atif *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	Atif <i>et al.</i> (2024)
Review title	Effectiveness of various methods of educating children and adolescents for the maintenance of oral health: A systematic review of randomized controlled trials.
Review coding	School-based; mixed providers
Contributing primary studies	The information presented in this extraction form applies to all 10/10 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): What is the effectiveness of various methods of educating children and adolescents for maintenance of oral health?</p> <p>PICO elements reported in Introduction/Methods:</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> • Patient or population: Children and adolescents of any gender residing in any geographical location • Intervention: Any modality of oral health education imparted to children • Comparison: Any oral health education intervention or not exposed to any such intervention • Outcome: Knowledge scores and/or oral health determinants such as plaque score, oral hygiene index score, indices for dental caries and white spot lesions. • Setting: school-based • Study design: Randomized controlled trials • Timeframe for follow-up: not specified

Number of participants: 1926 in total

Age (mean/mode/range): The age group of the studied population was in the range of 4–15 years

Participants

Gender: male and female

Details of any additional relevant participant characteristics:

Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.

Overview of relevant characteristics of primary studies included in systematic review:

Description of Interventions/ phenomena of interest

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Yazdani (2002) Iran	cRCT	399 male and female 15 year olds	School personnel. Daily actions recorded every week and returned to the teacher	Leaflet and video-based education	No educational intervention	12 weeks	Oral cleanliness and gingival health
Saied-Moallemi (2009) Iran	Community based RCT	457 male and female 9 year olds	School personnel/ Health counselors	School-based leaflets as illustrative puzzles,	No intervention	Not reported	Changes in dental plaque and gingival bleeding

Parameter	Extraction items							
					parent-supervised at home, and combined approach			
	Hebbal (2011) India	RCT Double-blind controlled field trial	150 12 year olds	Investigator	Oral health education using audiovisual aids (group 1), chalk and blackboard (group 2)	No informational session or oral hygiene instructions (group 3)	Not reported	Plaque scores
	John (2013) India	RCT	100 4–6-year-old preschool children from one school	Dentist, schoolteacher trained by dentist, dental residents	Oral health education lectures from dentist or teacher, and drama enacted method	No intervention	Not reported	Oral hygiene scores
	Maheswari (2013) India	RCT	120 5-10 year olds in one elementary school	Unclear/School personnel	Game-based teaching and flash cards	Conventional flash cards	Once a day for 7 days	Oral hygiene and dental index scores
	Kumar (2015) India	RCT	60 7-10 year olds	Unclear/School personnel	Combination of education by flash cards and	Only flash cards (group A)	Not reported	Oral hygiene and dental index scores

Parameter	Extraction items							
					game-based (connect the dots) method (group B)			
	Angelopoulou (2015) Greece	NRCT 2 armed parallel-group prospective clinical trial	184 male and female (approx. 10 years old) fourth grade	Dentist delivered lecture and teacher provided experiential learning	Experiential learning for 3 months	Traditional lecturing	Not reported	Oral health, gingival health and DMFT
	Al Bardaweel & Dashash (2018) Syria	cRCT	220 male and female 10 – 11 year olds	School personnel	e-learning program with colourful images, videos and quizzes	Conventional leaflet in the form of colorful comics with story “Adnan likes the dentist”	3 months	Gingival health and plaque scores
	Akkaya and Sezici (2020) Turkey	RCT	100 male and female 4-6 year olds	Kindergarten personnel	Instruction on how to brush their teeth	No additional instruction	3 months	Toothbrushing behaviours and plaque scores
	Aljafari (2022) Jordan.	RCT	136 male and female 6-8 year olds (N=278 randomised)	School personnel/researchers	Oral health education video game in school and at home	No intervention	5 months	[Knowledge,] changes in diet and toothbrushing practice, parental recognition of fluoride

Parameter	Extraction items								
									toothpaste, plaque scores and oral hygiene scores

Setting/context

Countries (no. studies) (in alphabetic order): India (4 studies); Iran (2 studies); Greece, Syria, Turkey, and Jordan (1 study each)

Setting (no. studies): school-based - Public schools (4 studies), Private schools (1 study); mostly urban areas reported

Other relevant features:

Databases and sources searched

Protocol prepared: Yes

- **If published, number and link:** registered in PROSPERO (CRD42023395001).

Number and names of databases: 6

6 databases

PubMed, LILACS, Web of Science, EMBASE, Scopus, and Cochrane databases

Other non-database sources:

Details of any other supplementary searches: The relevant journals pertaining to paediatric dentistry and community dentistry was also manually searched by two reviewers

- **Grey literature search:** Yes. Google Scholar and Open Grey
- **Reference chasing:** Yes
- **Expert consultation:** No

Search strategy/key words provided: Yes. Keywords and MeSH terms included in appendix,

Time period covered by searches: not reported

Search limits (e.g. date, language): No restriction of language or year of publication.

- **Are search limits justified/appropriate?** N/A

Screening completed in duplicate: Yes

Parameter	Extraction items
	<ul style="list-style-type: none"> If yes, rate of agreement: Authors reported that a good agreement (Cohen's Kappa=0.92 and 0.94, respectively) was observed <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> If yes, rate of agreement: Data were extracted by 2 reviewers (Cohen's kappa values ranging from 0.74 to 0.82) <p>Funding of review: the authors did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. No funding, grants, or other support were received to assist with the preparation of this manuscript, and for conducting this study.</p> <p>Conflicts of interest declared: The authors declare they have no relevant financial or nonfinancial interests to disclose, nor do they have any conflicts of interest to declare relevant to the content of this article.</p> <p>If declared, how conflicts of interest were managed: N/A</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: 2009 - 2022</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2009 (2 studies), 2011 (1 study), 2013 (1 study), 2014 (1 study), 2015 (2 studies), 2018 (1 study), 2020 (1 study), 2022 (1 study).</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 10 studies</p> <p>Number of studies by study design: all RCTs (7 studies) or cRCTs (2 studies) and NRCT (1 study)</p> <p>Funding of primary studies: not mentioned in 8 studies reported; 1 study funded by Colgate-Palmolive; 1 study funded by The Borrow Foundation, UK</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: Randomized controlled trial</p> <p>Reasons for including study design(s) provided? Yes</p>
Types of studies included	<ul style="list-style-type: none"> If yes, describe the reasons(s): In order to assess the highest quality of evidence and delineate the influences of other approaches such as parental education, and interventions involving operative or preventive procedures, this review included only randomized controlled trials (RCTs) and followed strict selection criteria. <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes. Included in appendix 3</p> <ul style="list-style-type: none"> Multiple interventions apart from the education - 6 studies

Parameter	Extraction items
	<ul style="list-style-type: none"> • Not a randomised controlled trial or a Short communication/ Comment on another article - 3 studies • Mother/ Parents involved too - 7 studies • Specific group of patients - 3 studies • Done in Adults/Residents - 2 studies • Focussed only on trauma - 1 study • Focussed not on effectiveness of the educational method - 1 study
Appraisal instruments used	<p>Full name of tool(s) used: The Cochrane RoB-2 tool</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> N/A</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>High risk of bias (low quality) (k=6 Yazdani 2002, Saied-Moallelemi 2009, Hebbal 2011, John 2013, Maheswari 2013, Angelopoulou 2015)), unclear/moderate risk of bias (some concerns) (k=3 Kumar 2015, Al Bardaweel and Dashash 2018, Akkaya and Sezici 2020), low risk of bias (high quality) (k=1 Aljafari 2022)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No meta-analysis performed • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes <ul style="list-style-type: none"> ○ Authors discussed the most common paucities were related to randomization, missing outcome data, and measurement of outcomes. The GRADE approach resulted in the downgrading of most of the outcomes to a very low

Parameter	Extraction items
	<p>level. Only three outcomes were graded as moderate and low. The grade of evidence was found to be very low due to the ROB in the source studies, indirectness in the outcomes, and imprecision. The high ROB in most of the primary studies and very low or low grade of evidence in the majority of outcomes are limitations of this systematic review</p> <p>Assessment of publication bias: A strategy to contact the authors of the studies with any discrepancy in data or incomplete information was formulated, though it was not required during the review.</p> <p>Meta-analysis could not be performed due to variability in the interventions, study periods, and outcome variables. Publication bias was considered in downgrading the quality of the evidence using GRADE</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? No • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number):</p> <p>Different studies were grouped by educational method. The interventions could broadly be categorized into educational leaflets/booklets/flash cards at school and at home, audiovisual aids, games in school and a combination of games and motivation in schools and leaflets for home, conventional teaching in the classroom, and smartphone-based interventions/e-learning. (page 10)</p> <p>Measures of outcome variables included plaque index, simplified Debris Index, Gingival Bleeding Index, Gingival Index, plaque score of Oral Hygiene Index. (page 10)</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <p>Meta-analysis could not be performed due to variability in the interventions, study periods, and outcome variables.</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: N/A • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? N/A <p>For prospective cohort studies:</p> <ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): No • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): • Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes where reported

Parameter	Extraction items																					
<p>Outcomes assessed</p>	<p>List of authors' primary outcomes:</p> <p>Outcomes of interest relate to the effectiveness of various methods of educating children for maintaining oral health. Oral health determinants such as plaque score, oral hygiene index score, indices for dental caries and white spot lesions were assessed.</p> <p>Knowledge whilst an outcome of interest for many of the included studies was not an outcome of interest to the current overview</p> <ul style="list-style-type: none"> • Comparison of Effectiveness of leaflet/flashcard/books versus other interventions versus controls • Comparison of Effectiveness of audiovisual versus conventional teaching versus control • Comparison of Effectiveness of smartphone-based intervention/e-learning versus leaflet/booklet/flash cards in school versus control • Comparison of Effectiveness of lectures using PowerPoint by the dentist versus other interventions versus control <p>List of authors' secondary outcomes: N/A</p> <ul style="list-style-type: none"> • 																					
<p>Results/findings</p>	<p><u>META-ANALYSIS FINDINGS</u> N/A</p> <p><u>NARRATIVE SYNTHESIS</u></p> <p>1. Comparison of leaflet/flash card/books versus other interventions versus controls</p> <p>4 studies made these comparisons (Yadzani; Saied-Moallemi; Maheswari; Kumar). Mostly positive reduction in plaque and gingival scores reported</p> <p>In Yadzani 2002 positive outcomes for oral cleanliness and gingival health per student were defined as showing reduction in, at minimum, 50% of the index teeth that had shown dental plaque or gingival bleeding at baseline. In comparison with the control group, improvements in oral cleanliness and gingival health measured by reductions in mean dental plaque/gingival bleeding indexes were statistically significant ($p < 0.001$) in both intervention groups, except for girls in the videotape group.</p> <table border="1"> <thead> <tr> <th></th> <th>mean PI base / reduction</th> <th>mean GI base / reduction</th> </tr> </thead> <tbody> <tr> <td>Leaflet</td> <td></td> <td></td> </tr> <tr> <td> Boys</td> <td>9.3 ± 3 / 4.2 ± 3.2</td> <td>4.3 ± 1.7 / 2.4 ± 2.1</td> </tr> <tr> <td> Girls</td> <td>3.8 ± 1.6 / 2.3 ± 2.0</td> <td>3.8 ± 1.6 / 2.3 ± 2.0</td> </tr> <tr> <td>Video</td> <td></td> <td></td> </tr> <tr> <td> Boys</td> <td>8.6 ± 2.7 / 4.2 ± 3.2</td> <td>3.9 ± 1.9 / 2.2 ± 2.1</td> </tr> <tr> <td> Girls</td> <td>8.2 ± 2.5 / 1.5 ± 2.9</td> <td>4.0 ± 1.6 / 1.9 ± 2.0</td> </tr> </tbody> </table>		mean PI base / reduction	mean GI base / reduction	Leaflet			Boys	9.3 ± 3 / 4.2 ± 3.2	4.3 ± 1.7 / 2.4 ± 2.1	Girls	3.8 ± 1.6 / 2.3 ± 2.0	3.8 ± 1.6 / 2.3 ± 2.0	Video			Boys	8.6 ± 2.7 / 4.2 ± 3.2	3.9 ± 1.9 / 2.2 ± 2.1	Girls	8.2 ± 2.5 / 1.5 ± 2.9	4.0 ± 1.6 / 1.9 ± 2.0
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Parameter	Extraction items																																
	<p>Saied-Moallemi 2009 observed a significant reduction ($p < 0.001$) in Plaque Index and Bleeding Index when using any of the interventions (puzzles at school (group 1), parental-aid at home (group 2), and combined approach (group 3)), when both genders were considered together and girls alone. It was not found to be significant in boys for combined interventions. Changes in gingival health (plaque index (PI), bleeding index (BI)) defined as differences in sum scores from baseline to follow-up reported mean and standard deviations (SD) as below:</p> <p>Group 1</p> <table border="0"> <tr> <td>PI</td> <td>-0.19 (1.29) boys</td> <td>0.07 (2.76) girls</td> <td>-0.05 (2.17) total</td> </tr> <tr> <td>BI</td> <td>2.79 (1.97) boys</td> <td>3.14 (1.33) girls</td> <td>2.97 (1.67) total</td> </tr> </table> <p>Group 2</p> <table border="0"> <tr> <td>PI</td> <td>1.36 (2.71) boys</td> <td>3.76 (3.80) girls</td> <td>2.52 (3.48) total</td> </tr> <tr> <td>BI</td> <td>4.17 (1.09) boys</td> <td>4.31 (1.23) girls</td> <td>4.24 (1.16) total</td> </tr> </table> <p>Group 3</p> <table border="0"> <tr> <td>PI</td> <td>1.13 (3.14) boys</td> <td>1.02 (3.09) girls</td> <td>1.08 (3.10) total</td> </tr> <tr> <td>BI</td> <td>2.92 (1.71) boys</td> <td>3.55 (1.26) girls</td> <td>3.20 (1.55) total</td> </tr> </table> <p>Control</p> <table border="0"> <tr> <td>PI</td> <td>0.85 (3.01) boys</td> <td>-0.41 (2.33) girls</td> <td>0.16 (2.71) total</td> </tr> <tr> <td>BI</td> <td>2.63 (2.28) boys</td> <td>1.64 (2.04) girls</td> <td>2.09 (2.20) total</td> </tr> </table> <p>In addition, positive outcomes were assessed as ‘acceptable oral hygiene’ (AOH) defined as a change in at least half the index teeth which had plaque at baseline to clean teeth at the outcome examination, was more frequent in the parental-aid (group 2) ($P < 0.001$) and the combined groups (group 3) ($P < 0.05$) compared to control. ‘Healthy gingiva’ (AGH) defined as an improvement in all the index teeth which showed bleeding at baseline, was more frequent in both groups where parents were involved ($P < 0.001$) compared to control.</p> <p>2 studies reported significant differences in oral hygiene pre- and post-values of the DI-S (simplified debris index) in boys/girls using flashcards and games (Maheswari 2013 and Kumar 2015)</p> <p>Maheswari 2013 used a leaflet in the form of flash cards and a game-based approach for 7 days and found statistically significant differences in the pre- and post-values of the DI-S in both the age groups and interventions, except for the children of 5–7 years of age educated by a leaflet (group A).</p>	PI	-0.19 (1.29) boys	0.07 (2.76) girls	-0.05 (2.17) total	BI	2.79 (1.97) boys	3.14 (1.33) girls	2.97 (1.67) total	PI	1.36 (2.71) boys	3.76 (3.80) girls	2.52 (3.48) total	BI	4.17 (1.09) boys	4.31 (1.23) girls	4.24 (1.16) total	PI	1.13 (3.14) boys	1.02 (3.09) girls	1.08 (3.10) total	BI	2.92 (1.71) boys	3.55 (1.26) girls	3.20 (1.55) total	PI	0.85 (3.01) boys	-0.41 (2.33) girls	0.16 (2.71) total	BI	2.63 (2.28) boys	1.64 (2.04) girls	2.09 (2.20) total
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Parameter	Extraction items														
	In group B (5-7 and 8-10) and group A (8-10) there was a significant increase in good oral hygiene scores and a significant decrease in fair and poor debris scores.														
	Number of 5–7 year-olds and 8-10 year-olds respectively in Group A (conventional) at baseline and 90 days														
	DI-S scores:	base/90 days		base/90 days											
		Good	3	9	5	15									
		Fair	24	21	19	15									
		Poor	3	0	6	0									
	Number of 5–7 year-olds and 8-10 year-olds respectively in Group B (game) at baseline and 90 days														
	DI-S scores:	base/90 days		base/90 days											
		Good	3	26	6	23									
		Fair	25	4	17	7									
		Poor	2	0	7	0									
	<p>Kumar 2015 with interventions similar to Maheswari 2013 demonstrated a statistically significant difference in the DI-S score between baseline and the 90 days of follow-up in both the groups. There was a significant increase from 0 to 15 children with good oral hygiene in group B compared to group A. The Debris Index-simplified (DI-S) was estimated on the six index teeth. The score ranged from 0 to 3. In addition to reporting number of children with improved oral hygiene a comparison of mean DI-S scores found the difference in group B was highly significant.</p> <table border="1"> <thead> <tr> <th>Group/timeline</th> <th>Base/3 months</th> <th>p-value (base to 3 months)</th> </tr> </thead> <tbody> <tr> <td>Group A Flash cards</td> <td>1.26 ± 0.37 / 0.94 ± 0.34</td> <td>< 0.01</td> </tr> <tr> <td>Group B Flash cards + game</td> <td>1.30 ± 0.35 / 0.73 ± 0.25</td> <td>< 0.001</td> </tr> </tbody> </table>						Group/timeline	Base/3 months	p-value (base to 3 months)	Group A Flash cards	1.26 ± 0.37 / 0.94 ± 0.34	< 0.01	Group B Flash cards + game	1.30 ± 0.35 / 0.73 ± 0.25	< 0.001
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Group B Flash cards + game	1.30 ± 0.35 / 0.73 ± 0.25	< 0.001													
	<p>2. Comparison of audiovisual versus conventional teaching versus control</p> <p>One study (Hebbal 2011) compared oral health education using audiovisual aids (group 1), a comprehensive program similar to group 1 without audiovisual aids (group 2), versus a control group who received no informational session (group 3). Mean plaque scores were analysed pre and post intervention after 6 weeks. Statistically significant differences in the improvements of mean plaque scores were reported in both interventions and the control groups (p < 0.001), however, the audiovisual group performed better.</p> <table border="1"> <thead> <tr> <th>Group/timeline</th> <th>Means (SD) pre / post</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>						Group/timeline	Means (SD) pre / post							
Group/timeline	Means (SD) pre / post														

Parameter	Extraction items	
Group 1	1.33 ± 0.70 /	0.62 ± 0.33
Group 2	1.35 ± 0.64 /	0.88 ± 0.48
Group 3	1.47 ± 0.67 /	1.01 ± 0.52

3. Comparison of smartphone-based intervention/e-learning versus leaflet/booklet/flash cards versus control

Two studies evaluated Smartphone-based interventions or e-learning programs measuring plaque and gingival index scores.

Al Bardaweel and Dashash 2018 used an e-learning program to deliver oral health-related information and compared it with the leaflet method. A significant **improvement** was seen in the **plaque score and gingival index** in both group comparisons ($p < 0.05$) when compared to baseline. Children in **the leaflet group** had significantly less plaque than those in **e-learning group** at 6 weeks (1.06 ± 0.33) and at 12 weeks (0.85 ± 0.35). Similarly, children in the leaflet group had statistically **significant better** gingival health than the e-learning group at 6 weeks (0.88 ± 0.25) and 12 weeks (0.74 ± 0.22). These findings suggest traditional educational leaflets are an effective tool.

Al Jafari 2022 used computer- and smartphone-based video games and compared them with the control group. They found a statistically significant **improvement** in the knowledge and **dietary practice scores** in the intervention group but not in the control group. Children's **mean plaque scores** in the intervention group measured at baseline (1.16 ± 0.30) and 3 months (1.17 ± 0.29) compared with controls revealed no statistically significant differences ($p = 0.08$). Children in the intervention group reported on average 1.2 (± 0.9) sugary snacks a day at baseline and 1.1 (± 0.9) at 3 months not significantly different to the control group.

4. Comparison of lectures using PowerPoint by the dentist versus other interventions versus control

Three studies compared different lecture approaches. Two studies compared PowerPoint presentation by the dentist with conventional teaching and other educational methods.

In **John 2013** children were assigned to 3 intervention groups dentist lecture, teacher lecture, researcher drama enactment and control. Comparison found statistically significant **improvement** in the oral hygiene based on the DI-S scores between the pre- and post-intervention data in all four groups respectively (0.1579 ± 0.2775 , 0.3048 ± 0.3263 , 0.4124 ± 0.4815 , 0.384 ± 0.1788). Only the oral health education by drama by residents showed better post-intervention scores than controls.

In the longitudinal prospective clinical trial carried out by **Angelopoulou 2015** oral health education through experiential learning (EL) was compared with traditional dentist delivered PowerPoint lecture, after 6 months and 18 months. Oral hygiene was recorded

Parameter	Extraction items
	<p>as present or absent dental plaque measured using a modified hygiene index (HI) and gingivitis using the simplified gingival index (GI-S).</p> <p>Oral hygiene decreased for the EL group at 6 months 69.4 (46.7, 83.3) from 64.6 (38.0, 83.3)baseline (plaque HI %)/Median (IQR)) but improved at 18 months 55.6 (29.2, 79.2); it was worse in the TL group 66.7 (37.6, 83.3) at 18 months from 57.7 (30.6, 80.6) baseline. Gingivitis increased for both groups at 6 months in a non-statistically significant level and then decreased at 18 months.</p> <p>Finally, Akkaya and Sezici 2020 used playful learning in classrooms as an intervention and found a statistically significant difference between the experimental group and controls, in terms of hygiene as upper and lower jaw plaque scores. Statistical significance in the study was accepted as $p < 0.05$.</p> <p>The upper jaw plaque indexes reduced from 0.620 ± 0.562 (baseline) to 0.196 ± 0.316 in the playgroup, and lower jaw plaque indexes reduced from 0.704 ± 0.65 (baseline) to 0.204 ± 0.213. Both upper and lower jaw plaque indexes increased in the control group.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes</p>
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence: Not discussed by authors.</p> <p>Causes of heterogeneity investigated? No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	<p>A wide variability in terms of the study designs, population groups, interventions used, outcome variables, and conclusions are presented. The trials compared 12 methods of education, the authors broadly categorized into seven types –</p> <p>educational leaflets/booklets/flash cards at school and at home,</p> <p>audiovisual aids, games in school</p> <p>a combination of games and motivation in schools</p> <p>leaflets for home,</p>

Parameter	Extraction items
	<p>conventional teaching in the classroom, smartphone-based interventions/e-learning.</p> <p>The high ROB in most of the primary studies and very low or low grade of evidence in the majority of outcomes are limitations of this SR. Review authors suggest that “The paucities highlighted in the primary studies such as variability in the sample sizes and techniques, the outcome variables, lack of details regarding the randomization, blinding and other essential features of trials, lack of information about funding (presented only in two studies), and comparison of the outcome variables between the groups can be used as a roadmap by researchers in this domain of paediatric dentistry for improving the quality and certainty of evidence.”</p> <p>Lack of definition of abbreviations in the review resulted in accessing the included primary studies to discern meaning.</p>

Colvara *et al.* (2020) – Extraction form

Parameter	Extraction items
First author and year of publication	Colvara <i>et al.</i> (2020)
Review title	Motivational interviewing for preventing early childhood caries: A systematic review and meta-analysis
Review coding	Early childhood; Mixed providers; Motivational Interviewing (MI)
Contributing primary studies	The information presented in this extraction form applies only to the 10/14 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (i.e. Primary outcomes (as defined by systematic review authors)).
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): This systematic review with meta-analysis aimed to assess whether motivational interviewing is effective in the prevention of early childhood caries (ECC).</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: children 0-6 years with deciduous dentition, pregnant woman or children's mothers could be considered • Intervention: Interventions based on motivational interviewing or indicating that a counselling technique based on the principles developed by Miller and Rollnick used for oral health education. • Comparison: any type of oral health education or negative controls without any specific intervention. • Outcome: main outcome was new caries lesions

Parameter	Extraction items
	<ul style="list-style-type: none"> • Setting: not specified • Study design: Randomized controlled trials, cluster randomized controlled trials and community-based randomized controlled trials, which included motivational interviewing as an approach, • Timeframe for follow-up: not specified

Participants

Number of participants: not reported.
 Totalled based on participant numbers reported for each of the **10 included studies:** 4337 participants
Age (mean/mode/range): 0 – 6-year-olds
Gender: no information provided
Details of any additional relevant participant characteristics:

**Description of Interventions/
phenomena of interest**

Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.

Overview of relevant characteristics of primary studies included in systematic review: Of the fourteen studies included, four did not evaluate caries as the main outcome, hence not included in current synthesis.

All RCT study design not individually specified. No individual participant numbers provided in systematic review report or characteristics table (numbers identified from relevant abstracts)

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Weinstein 2004, 2006 *Harrison 2007 Canada (referenced in the meta-analysis)	RCT	N=240 infants between 6-8 months South Asian immigrants	3 South Asian women (10-hour training)	One MI session (45 minutes) Six telephone calls Two postal cards In addition to a pamphlet and viewed a 11-minute educational video	Each subject received a pamphlet and viewed a 11-minute educational video	Biannual call Follow-up at 12 months, 2 years	Modified criteria of Radike including white spots

Parameter	Extraction items							
	*Ismail 2011 US	RCT	N=599 caregivers of 0-5 years African-American children from low-income families	Master's-level therapists from the community (2-days training)	One MI session (40 minutes) A 15-minute educational video One telephone call A copy of the printed goals	A 15-minute educational video and received a list of recommendations	Follow-up at 24 months	ICDAS
	*Harrison 2012 Canada	RCT	N=241 Cree pregnant women and mothers of young children	Existing "community health representatives" or local women (2 days training)	One to seven MI sessions (unreported duration) menu developed specific to various age ranges pamphlet that explained children's dental care practices	Pamphlets explaining children's dental care practices were mailed to mothers when their children were ages 6 and 18 months	Follow-up at 24 months	Caries with substance loss (d2) without inclusion of white spots
	*Mohammadi 2015 Iran	RCT	N=222 children between 4-6 years old	There is no report of who was the counsellor nor the training duration	One MI session (45 minutes) An interview with a parent, in the presence of their child, with an oral health recommendations' menu. An oral health education lecture	Traditional oral health education lecture and 11 minute video with children and parents	Follow-up at 6 months	ICDAS (caries was considered code three onwards)

Parameter	Extraction items							
					and an 11 minute video Six telephone calls Two postal cards			
	Manchanda 2015 India	RCT	N=387 Mothers of 6-18 months old infants from primary health centers	There is no report of who the counsellor was nor the training duration	Group A. One MI session (unreported duration) Two telephone Calls 2 appointments in primary health centre Group B. One MI session (unreported duration)	No intervention	Follow-up at 8 months	Caries Criteria by WHO + initial lesion
	Saengtipbovorn 2017 Thailand	RCT	N=196 Parents or caregivers of 6 months to 5 years old children in a well-baby clinic	Dental hygienist (one day training)	One MI session (15 minutes) for parents with individualised oral hygiene instruction and counselling 2 reinforcement education sessions with individual counselling (10 minutes) A caries risk assessment, and	One traditional education session (10 minutes) Child oral examination, individual oral hygiene instruction and fluoride varnish	Follow-up at 3 months & 6 months	Caries cavitated and non-cavitated carious lesions

Parameter	Extraction items							
					fluoride varnish applied in moderate and high risk children.			
	*Colvara 2018 Faustino-Silva 2019 Brazil	RCT	N=320 Mothers and children	Dentist or dental hygienists (8 hours training)	One (78.9%) or two MI sessions (21.1%) (20-40 minutes) At least one dental visit in the first year of life with information on preventing early childhood caries based on MI training	One (82.8%) or two traditional education sessions (17.2%) (20-40 minutes) At least one dental visit in the first year of life with information on preventing early childhood caries	Follow-up at 3 years	ICDAS
	*Batliner 2018 US	RCT	N=579 Mother or caregiver of a newborn American Indian child (up to 3 months of age)	Local people, living on the reservation or nearby, and were required to have a college degree (2 days training)	Four MI sessions (45-60 minutes) 2 topics addressed at each visit at baseline, 6, 12, and 18 months. Enhanced community services	Enhanced community services	Follow-up at 3 years	Caries presence in primary teeth dmfs (white spot lesions were not considered)
	*Henshaw 2018 US	RCT	N=1,065 pregnant women and mothers of young	Oral health advocates were public housing residents	A maximum of 9 MI sessions (30 minutes) Fluoride varnish, written handouts	Fluoride varnish and written handouts about 1 of the 9 topics available	Follow-up at 12 and 24 months	Caries criteria (white spot lesions were

Parameter	Extraction items							
			children aged 0-5 years living in Public Housing	themselves with a high school education (8 hours training)	about 1 of the 9 topics available and quarterly MI counselling.			considered sound) increment in dmfs (decayed, missing, and filled tooth surfaces)
	*Jamieson 2018, 2019 Australia	RCT	N=448 pregnant women with an Aboriginal child	There is no report of who was the counsellor (3 days training) at four time-points from pregnancy through to 18-months	Four MI sessions (30-90 minutes) Dental care to mothers during pregnancy	No intervention	Follow-up at age 2 years	dmft (teeth with cavitated or non-cavitated carious lesions)
	Makvandi 2015 Iran							Dental caries not evaluated
	Riedy 2015 US							Dental caries not evaluated
	Freudenthal 2010 US							Dental caries not evaluated
	Naidu 2015 Trinidad							Dental caries not evaluated

Parameter	Extraction items
Setting/context	<p>MI (Motivational interviewing); dmfs (decayed, missed, filled permanent tooth); ICDAS (International Caries detection and Assessment System)</p> <p>Countries (no. studies) (in alphabetic order): Included studies were performed in seven different countries:</p> <p>Australia: 1 study (Jamieson 2018/2019)</p> <p>Brazil: 1 study (Colvara 2018)</p> <p>Canada: 2 studies (Weinstein 2004/2006/Harrison 2007, Harrison 2012)</p> <p>India: 1 study (Manchanda 2015)</p> <p>Iran: 1 study (Mohammadi 2015)</p> <p>Thailand: 1 study (Saengtipbovorn 2017)</p> <p>United States: 3 studies (Ismail 2011, Batliner 2018, Henshaw 2018);</p> <p>Setting (no. studies): Not specified</p> <p>Other relevant features: n/a</p>
Databases and sources searched	<p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> If published, number and link: (PROSPERO 2019 CRD42019128819) Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD42019128819 <p>Number and names of databases: 7 databases were searched - PubMed, EMBASE, Virtual Health Library, Scopus, Cochrane Central Register of Controlled Trials, Web of Science, LILACS</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> Grey literature search: Yes. Google Scholar Reference chasing: Not reported Expert consultation: Not reported <p>Search strategy/key words provided: Yes. Sample provided in appendix 1</p> <p>Time period covered by searches: Up to September 2019</p> <p>Search limits (e.g. date, language): There were no restrictions in terms of language or publication date.</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> • Are search limits justified/appropriate? Not applicable <p>Screening completed in duplicate: Yes. All papers were screened independently by title and abstract by two reviewers</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Rate not reported. Disagreements were resolved by discussions. <p>Extraction completed in duplicate: Unclear. Articles that met all inclusion criteria were carefully read for data extraction by a standardized and pretested spreadsheet.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: <p>Funding of review: Not reported</p> <p>Conflicts of interest declared: The authors reported they had no conflicts of interest to declare.</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: Included studies were published from 2004 to 2019</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2004 (1 study), 2011 (1 study), 2012 (1 study), 2015 (2 studies), 2017 (1 study), 2018 (4 studies)</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 10 studies (of 14) included in current synthesis</p> <p>Number of studies by study design: 10 RCTs</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: Randomized controlled trials, cluster randomized controlled trials and community-based randomized controlled trials, which included motivational interviewing as an approach</p>
Types of studies included	<p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Risk of bias was assessed following the Cochrane Handbook for Systematic Reviews of Interventions version 5.1.0</p>

Parameter	Extraction items
	<p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Confounding: Yes/No • Selection bias: Yes/No • Exposure and outcomes: Yes/No • Selective reporting: Yes/No

Risk of bias assessment was generated only for those 8 studies included in the meta-analysis. Review authors reported that allocation concealment was unclear in most studies, while several studies did not provided data for proper risk assessment. No risk of bias assessment was reported for 2 studies included in the current synthesis (Saengtipbovorn 2017 and Manchanda 2015).

Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):

The authors did not provide an overall assessment of risk of bias for each trial. Allocation concealment was reported as unclear in most studies, authors reported that several studies did not provided data for proper risk assessment. Authors reported that three studies presented high bias in the quality of motivational interviewing training (Harrison 2007 [Weinstein 2004], Harrison 2012, Mohammidi 2015).

However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the 8 trials included in the meta-analysis appeared to have a high risk of bias (k=4) [Harrison 2007 [Weinstein 2004], Harrison 2012, Mohammidi 2015, Ismail 2011], (unclear risk of bias (k=1) [Henshaw 2018] and low risk of bias (k=3) [Batliner 2018, Colvara 2018, Jamieson 2018].

Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):

- **Only low risk of bias RCTs included in review:** No
- **Only low risk of bias RCTs included in meta-analysis:** No
- **If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the**

Appraisal ratings

Parameter	Extraction items
	<p>summary/discussion/conclusions? Minimal discussion, more relating to the diversity of the interventions and controls and few studies included in meta-analysis.</p> <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Bias was investigated using the Funnel plot graph and Egger's and Begg's test of bias. • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): Funnel plot inspection identified an asymmetry caused by the two studies from Harisson (2007, 2012), and bias was confirmed in Egger's (P = .05) and Begg's (P = .03) tests.
Method of analysis	<p>Authors description of method of analysis (include page number): Studies that met any inclusion criteria were considered for qualitative analysis. Only studies that evaluated the main outcome were included in the meta-analysis. (page 2) All analyses were performed using Review Manager version 5.3 and Stata Statistical Software. (page 3)</p> <p>Authors' justification for narrative synthesis or meta-analysis: A summary of the characteristics of each study included (e.g. study population, intervention characteristics, who delivered the intervention) was done using a descriptive synthesis. Different publications that comprised the same study were summarized together.</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: For quantitative synthesis, the combined estimate of intervention's effects was calculated from the mean difference in each included study. Meta-analysis was performed using the final follow-up per group, the final dmfs or dmft and standard deviation (or confidence intervals). • Subgroup analysis was performed by the control group dmft/dmfs, as authors reported that the control population was closer to the profile of the populations from the original samples. Three studies (Batliner 2018, Harrison 2007, Harrison 2012) with the highest mean dmft/dmfs values composed a subgroup, and the other five studies (Colvara 2018, Henshaw 2018, Ismail 2011, Jamieson 2018, Mohammadi 2015) composed the subgroup with the lowest mean dmft/dmfs values. • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. Heterogeneity was assessed by the chi-square test (P < .05) and I-square index, and the meta-analysis was performed using a random-effects model. In order to investigate sources of heterogeneity, subgroup analysis was performed. When data were missing, sensitivity analysis or data imputation was performed to estimate extreme scenarios and standard deviation. <p>For prospective cohort studies: Not applicable</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): Yes/No • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): • Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes/No

Outcomes assessed

List of authors' primary outcomes: The main outcome was new caries lesions. 10 studies evaluated caries as the main outcome and only eight of these were included in the quantitative analysis with 3298 patients completing the studies. Review authors reported that in two studies, data were still missing despite attempts to contact the authors.

- Primary outcome 1: Caries level compared to baseline caries level

List of authors' secondary outcomes: Not applicable

META-ANALYSIS FINDINGS

Primary outcomes: Caries lesions

Results/findings

The relevant findings or results presented by the included research syntheses must be extracted. For quantitative reviews, this will ideally be an effect estimate with 95% CIs or measure from a presented meta-analysis. Measures of heterogeneity should also be extracted where applicable.

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Caries level	MI oral health education compared to any type of oral health education or no specific intervention	dmft/dmfs	8 studies N=3298 (Batliner 2018, Harrison 2007, Harrison 2012) highest control mean group; (Colvara	MD -0.61 [-1.22, -0.01]	0.05	56% [62% among subgroup reporting highest dmft/dmfs in control; 0% among subgroup reporting highest	These comparisons used a random-effects model analysis for overall mean difference in dmft/dmfs among any control and MI groups. Subgroup analysis was performed by the control group dmft/dmfs, grouped by highest mean	

Parameter	Extraction items								
				2018, Henshaw 2018, Ismail 2011, Jamieson 2018, Mohammadi 2015) lowest control mean group			dmft/dmfs values]	dmft/dmfs (3 studies) and lowest mean dmft/dmfs (5 studies) showed effectiveness of MI-based interventions is modified by the caries experience in the population examined. In populations with high caries experience, the MI-based approach proved preventing an average of 3.15 (95% CI: -6.14, -0.17) dmfs in young children. In samples with low caries experience, differences were smaller, since the caries levels were already lower (-0.31; 95% CI: -0.63, 0.00).	

Secondary outcomes: not applicable

NARRATIVE SYNTHESIS

Primary outcomes: not applicable

Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes/No

Parameter	Extraction items
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Causes of heterogeneity investigated? Yes. Heterogeneity found seems compatible with an effect modification or publication bias. Both explanations pointed to a couple of small studies with large effects in favour of the intervention among high-risk groups. Review authors stated they had very few studies (n = 8) included, and the chance of a false significant result in Egger's test is relatively high.</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • Review authors reported that there was no heterogeneity among results from the trials within the subgroup formed by the lowest dmft/dmfs values (P = .55). However, there is moderate unexplained heterogeneity among trials reporting data for the highest dmft/dmfs value subgroup (I² = 62%; P = .07). Four other subgroup analyses were performed in order to determine potential sources of heterogeneity, but did not explain it and there were no differences in the effect measures: number of MI sessions and menu use (list of dietary and nondietary recommendations presented to caregivers) were collinear, ≤4 MI sessions without menu use vs >4 MI sessions with menu use (chi-square test for subgroup differences = 0.72, P = .40), mixed dentition vs deciduous dentition (χ² = 0.85, P = .36), ICDAS for caries' diagnosis vs any other (χ² = 0.17, P = .68) and with white spots vs without white spots (χ² = 0.05, P = .83). (page 4) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	Review authors considered Weinstein 2004, 2006 and Harrison 2007 as the same study – however, considered different studies in other systematic reviews that included these trials.

Dadipoor *et al.* (2023) – Extraction form

Parameter	Extraction items
First author and year of publication	Dadipoor <i>et al.</i> (2023)
Review title	Educational Intervention of Improve Student's Oral Health: A Systematic Review and Meta-Analysis School-Based
Review coding	Provider: Some unclear providers; Participants: School children
Contributing primary studies	The information presented in this extraction form applies only to 12/12 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews

Parameter	Extraction items																
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): The research aimed to assess the effects of oral health intervention programs at school level on students' oral hygiene in developing countries.</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: to include primary, middle, and high school populations, to include male and female students at primary and secondary schools, to include the age group of 6-18 • Intervention: educational interventions at schools aiming to increase oral health (OH) scores of knowledge, attitude, behavior, gingivitis, dental plaque and the decay-missing-filled (DMFT) • Comparison: research groups with any sort of oral health education (OHE) intervention/control • Outcome: assessment of the OH score of knowledge, attitude, and behaviors such as brushing and flossing explored by any instrument used in the body of research (e.g. questionnaire or interview), gingivitis, dental plaque and DMFT The gingival level was measured by gingival scores, and the dental plaque by plaque and DMFT scores (those of decayed, missing and filled teeth). • Setting: School-based • Study design: The papers to be included were random controlled trials (RCTs) or cluster-RCTs such as quasi- experimental works of research aiming to promote students' OH (e.g. to lower the rate of dental plaque), relevant knowledge, attitude, and behaviour in one or more school-based intervention (the case vs. consistent oral hygiene education as the control). • Timeframe for follow-up: Not reported 																
Participants	<p>Number of participants: 2,838 student participants</p> <p>Age (mean/mode/range): Not reported</p> <p>Gender: Not reported</p> <p>Details of any additional relevant participant characteristics:</p>																
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest								
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest										

Parameter	Extraction items							
	Andarkhora 2018 Iran	Quasi-experimental*	90 primary school children	Not reported	I _g 1: lecture I _g 2: Multimedia	Control group	Follow-up: 1 month	Knowledge, Attitude, Behaviour
	Chandrashekar 2014 India	Cluster-RCTS	141 middle school children	Dentists and schoolteachers	I _g 1: Dental health education (DHE) by a well-trained Dentist + using the audio-visual aids I _g 2: DHE by the well-trained schoolteachers I _g 3: DHE by the well-trained schoolteachers + OH aids (toothbrush and toothpaste)	Control group	Follow-up: 3 months	Plaque Index (PI), Decayed, missed, filled permanent tooth (DMFT), Gingival Index (GI)
	Ganapathi 2015 India	RCTS	200 middle school children	Not reported	I _g 1: Audio record I _g 2: Pamphlets I _g 3: Tooth models I _g 4: Multisensory	Control group	Follow-up: 2 months	Knowledge, Plaque Index (PI)

Parameter	Extraction items							
	Haleem 2012 Pakistan	Cluster-RCT	200 primary school children	Dentists, teachers, peers	Booklet supplemented, session Ig1: Dentist-led Ig2: Teacher-led Ig3: Peer-led Ig4: Self-study	Control group	Follow-up: 6 months	Knowledge, Behaviour, Plaque Index (PI) Gingival Index (GI)
	D'Cruz 2013 India	RCTS	568 middle school children	Not reported	Ig1: A lecture in the form of a PowerPoint slide Ig2: lecture, a demonstration of the tooth brushing method	Control group	Follow-up: 9 months	Knowledge, Behavior, Plaque Index (PI), Gingival Index (GI)
	Hassani 2016 Iran	Quasi-experimental	80 middle school children	Not reported	Ig: Booklet, CD, session	Control group	Follow-up: 1 month	Knowledge, Attitude, Behaviour
	Khudanov 2018 Uzbekistan	RCTS	86 high school children	Not reported	Ig: Lesson, lecture, messages, demonstration al models	Control group	Follow-up: 2 months	Knowledge, Attitude, P =B for Behaviour Plaque index

Parameter	Extraction items							
	Sadana 2017 India	RCTS	200 middle school children	Not reported	lg1: verbal communication lg2: verbal communication and self-taught pamphlets lg3: audiovisual aids and verbal communication	Control group	Follow-up: 1.5 months	Knowledge, Decayed, missed, filled permanent tooth (DMFT)
	Mohamadk hah 2013 Iran	Quasi-experimental	300 middle school children	Not reported	lg1: movie lg2: lecture	Control group	Follow-up: 3 months	Knowledge, Attitude, Behaviour
	Vangipuram 2016 India	RCTS	450 middle school children	Dentists and peers	lg1: Dentist led - PowerPoint slide, chalk and talk presentation, using charts, posters, booklets and tooth brushing demonstration models lg2: Peer-led using same methods as above	Control group	Follow-up: 6 months	Knowledge, Behaviour, Plaque Index (PI), Gingival Index (GI)

Parameter	Extraction items							
	Yazdani 2009 Iran	Cluster-RCTS	388 high school children	Not reported	Ig1: Leaflet Group Ig2: Videotape Group	Control group	Follow-up: 3 months	Plaque Index (PI), Gingival Index (GI)
	Yang 2009 Taiwan	Cluster-RCTS	135 high school children	Not reported	Ig: lectures, role-play, small group discussion and group contests	Control group	Follow-up: Not reported	Knowledge, Attitude, Behaviour

*Quasi-experimental research involves the manipulation of an independent variable without the random assignment of participants to conditions or the orders of conditions.

Countries (no. studies) (in alphabetic order):

India (5 studies – 1 cRCT - Chandrashekar, 2014; 4 RCTs - Ganapathi, 2015; D'Cruz, 2013; Sadana, 2017; Vangipuram, 2016)

Iran (4 studies – 3 Quasi-experimental - Andarkhora, 2018; Hassani, 2016; Mohamadkhah, 2013; 1 cRCT - Yazdani, 2009)

Setting/context

Pakistan (1 study – 1 cRCT - Haleem, 2012)

Taiwan (1 study – 1 cRCT - Yang, 2009)

Uzbekistan (1 study – 1 RCT - Khudanov, 2018)

Setting (no. studies): School-based

Other relevant features:

Protocol prepared: No

- **If published, number and link:** N/A

Databases and sources searched

Number and names of databases:

4 databases

- MEDLINE Ovid (from 2000 to Mar 2020)

Parameter	Extraction items
	<ul style="list-style-type: none"> • Embase Ovid (from 2000 to Mar 2020) • Scopus (from 2000 to Mar 2020) • Web of Science (from 2000 to Mar 2020) <p>Other non-database sources: Not reported</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes <ul style="list-style-type: none"> • Google • Google Scholar • Reference chasing: Yes Reference lists of relevant articles were scanned to find more papers (known as snowball sampling) • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: From 2000 to Mar 2020</p> <p>Search limits (e.g. date, language):</p> <p>Date: from 2000 to Mar 2020</p> <p>Language: English and Persian</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? No <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported. Any case of disagreement (between the two reviewers) was solved in a cordial discussion. If still not solved, the problem was tackled in consultation with a third researcher. <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: The authors would like to thank the research deputy of Shahid Beheshti University of Medical Sciences for their financial support.</p> <p>Conflicts of interest declared: The authors declare that there is no conflict of interests.</p> <p>If declared, how conflicts of interest were managed: n/a</p>

Parameter	Extraction items
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: Studies were published between 2009 and 2018.</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2009 (2 studies), 2012 (1 study), 2013 (2 studies), 2014 (1 study), 2015 (1 study), 2016 (2 studies), 2017 (1 study), 2018 (2 studies).</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 12</p> <p>Number of studies by study design:</p> <ul style="list-style-type: none"> • cRCT (4 studies: Chandrashekar, 2014; Haleem, 2012; Yazdani, 2009; Yang, 2009) • RCT (5 studies: Ganapathi, 2015; D'Cruz, 2013; Khudanov, 2018; Sadana, 2017; Vangipuram, 2016) • Quasi-experimental (3 studies: Andarkhora, 2018; Hassani, 2016; Mohamadkhah, 2013) <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: The papers to be included were random controlled trials (RCTs) or cluster-RCTs such as quasi- experimental works of research aiming to promote students' OH (e.g. to lower the rate of dental plaque), relevant knowledge, attitude, and behaviour in one or more school-based intervention (the case vs. consistent oral hygiene education as the control).</p>
Types of studies included	<p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): N/A <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used:</p> <ul style="list-style-type: none"> - Quality assessment evaluated by two reviewers (ASM and SD) independently for methodological quality with using standardized instruments from the Joanna Briggs Institute (JBI) for experimental and observational studies. - The Cochrane Collaboration tool was used to check for the risk of bias assessed in seven domains: random sequence generation, allocation concealment, blinding of participant, that of outcome assessment, incomplete outcome data, selective reporting and other forms of bias. This was actualized by the assignment of "low risk of bias," "high risk of bias" or "unclear risk of bias" rulings. <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> N/A</p>
	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>Any case of disagreement (between the two reviewers) was solved in a cordial discussion. If still not solved, the problem was tackled in consultation with a third researcher.</p> <ul style="list-style-type: none"> • High risk of bias (low quality) (k=8) - Andarkhora, 2018; Hassani, 2016; Ganapathi, 2015; Mohamadkhah, 2013; Yazdani, 2009; Haleem, 2012; Vangipuram, 2016; D'Cruz, 2013. • Unclear/moderate risk of bias (unclear/moderate quality) (k=4) - Chandrashekar, 2014; Khudanov, 2018; Sadana, 2017; Yang, 2009. • None of the included papers reported a low risk.
Appraisal ratings	<p>The authors provided an overall assessment of risk of bias for each trial. The HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have ROB as reported.</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): Not reported</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed?

Parameter	Extraction items
Method of analysis	<ul style="list-style-type: none"> • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): <p>Authors description of method of analysis (include page number):</p> <p>"RevMan 2014 was used for the meta-analysis. In advance to a combined analysis, data heterogeneity was tested in the sample of papers. It was tested in each analysis via I2 statistic. To test the changes in variables, the mean difference (MD) was used, and a 95% confidence interval (CI) was set in the same instrument. Moreover, if the instruments applied were not similar, the standardized mean difference (SMD) was adopted. The measures of parametric data were used: mean difference in Plaque Index (pre- and post-test steps) and standard deviations, mean difference in gingivitis (pre- and post-test) and standard deviations." p503</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: Not reported • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes - The authors used appropriate techniques: <ul style="list-style-type: none"> ○ They used random-effects models (as stated on page 505: "The heterogeneity of the included papers was tested by calculating tau² and I². As the estimated value was above 25%, we went for a random effects model") ○ They calculated heterogeneity using I² statistics for each analysis ○ They used standardized mean difference (SMD) when instruments were not similar across studies ○ They applied 95% confidence intervals ○ They did not discuss combining cRCTs and RCTs in meta-analysis <p>For prospective cohort studies: N/A</p> <ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): N/A • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): N/A • Summary effect estimates reported separately for RCTs and prospective cohort studies: N/A
Outcomes assessed Included here should be the outcomes of interest to the overview of review question(s) reported on by the research synthesis, i.e. the names or	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Gingival index • Primary outcome 2: Knowledge • Primary outcome 3: Attitude • Primary outcome 4: Behaviour

Parameter	Extraction items
labels of the outcomes (see below for presentation of results).	<ul style="list-style-type: none"> • Primary outcome 5: Dental plaque • Primary outcome 6: DMFT

List of authors' secondary outcomes: Not applicable

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings
The relevant findings or results presented by the included research syntheses must be extracted. For quantitative reviews, this will ideally be an effect estimate with 95% CIs or measure from a presented meta-analysis. Measures of heterogeneity should also be extracted where applicable.

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Oral health-related knowledge	Not relevant	n/a	n/a	n/a	n/a	n/a	Not relevant	Not relevant
Oral health-related attitude	Not relevant	n/a	n/a	n/a	n/a	n/a	Not relevant	Not relevant
Oral health-related behavior	Educational intervention versus usual care	Any instrument used in the body of research (e.g. questionnaire or interview)	6 studies – 12 comparisons (Andarkhora, 2018 (1); Andarkhora, 2018 (2); D'Cruz, 2012 (1); D'Cruz, 2012 (2); Haleem, 2012 (1); Haleem,	SMD 4.74 (95% CI 3.70, 5.77)	P<0.0001	99%	n=786 (experimental) n=1072 (control) Students' OH-related behavior was measured in 8 papers (19, 20, 23, 25, 27, 29) with 1,909 (1324 participants not 1909) student participants. These were incorporated in the	

Parameter	Extraction items									
				2012 (2); Haleem, 2012 (3); Haleem, 2012 (4); Hassani, 2016; Khudanov, 2018; Mohamadkhah, 2013 (1); Mohamadkhah, 2013 (2))				meta-analysis conducted by the present authors. OH behavior scores improved dramatically more in students with an OH educational intervention than peers with none (SMD 4.74, 95% CI 3.70 to 5.77; I2 = 99; P< 0.00001)		
Plaque index	Educational intervention versus usual care	Plaque index (specific index not noted)	8 studies – 21 comparisons (Chandrashekar, 2014 (1); Chandrashekar, 2014 (2); Chandrashekar, 2014 (3); D'Cruz, 2013 (1); D'Cruz, 2013 (2); Ganapathi, 2015 (1); Ganapathi, 2015 (2); Ganapathi, 2015 (3); Ganapathi, 2015 (4);	SMD – 1.01 (95% CI - 1.50, - 0.51)	P<0.001	97%	n=1468 (experimental) n=1710 (control) (overcounting) Dental plaque scores improved tremendously more in students who enjoyed an OH educational intervention than the control group with only usual care (SMD - 1.01, 95% CI -1.50 to - 0.51; I2 = 97; P< 0.0001)			

Parameter		Extraction items								
				Haleem, 2012 (1); Haleem, 2012 (2); Haleem, 2012 (3); Haleem, 2012 (4); Khudanov, 2018; Sadana, 2017 (1); Sadana, 2017 (2); Sadana, 2017 (3); Vangipuram, 2016 (1); Vangipuram, 2016 (2); Yazdani, 2009 (1); Yazdani, 2009 (2))						
Gingival index	Educational intervention versus usual care	Gingival index (no specific index noted)	4 studies – 9 comparisons (Chandrashekar, 2014 (1); Chandrashekar, 2014 (2); Chandrashekar, 2014 (3); D'Cruz, 2013 (1); D'Cruz, 2013 (2);	SMD 0.33 (95% CI - 0.36, 1.02)	P=0.34	98%	n=956 (experimental) n=1240 (control) incorrectly reported and scores possibly reversed as increased scores reflect a worse outcome Gingival scores were increased dramatically more in students with			

Parameter	Extraction items								
				Vangipuram, 2016 (1); Vangipuram, 2016 (2); Yazdani, 2009 (1); Yazdani, 2009 (2))				the OH-related educational intervention than students with none (SMD 0. 33, 95% CI -0. 36 to 1. 02; I2 = 98; P=0.34)	

NARRATIVE SYNTHESIS = None reported

Separate summaries reported for RCTs and non-randomised studies when included in the same review? No

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

The authors provide minimal commentary on the impact of heterogeneity. They state in their Methods section: "In advance to a combined analysis, data heterogeneity was tested in the sample of papers. It was tested in each analysis via I² statistic." They recognised that "As the estimated value was above 25%, we went for a random effects model."

Heterogeneity

Causes of heterogeneity investigated? No

- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**
- **If yes, provide a brief indication of the extent of heterogeneity in the relevant results:**

Comments

Unusable data due to inaccuracies in the meta-analysis

Faghihian *et al.* 2020 – Extraction form

Parameter	Extraction items
First author and year of publication	Faghihian <i>et al.</i> (2020)
Review title	Impact of motivational interviewing on early childhood caries A systematic review and meta-analysis

Parameter	Extraction items																
Review coding	Early childhood caries; Motivational Interviewing; Mixed providers some unclear																
Contributing primary studies	The information presented in this extraction form applies to all 8/8 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews																
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): Authors aimed to systematically review the randomized clinical trials to evaluate the effectiveness of an MI-based intervention for parents on the clinical reduction of ECC compared with traditional dental health education (DHE), as well as to define the limitations of these studies. (page 651)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: parents and caregivers • Intervention: educated by means of Motivational Interviewing (MI) • Comparison: traditional Dental Health Education (DHE) • Outcome: clinical rates of early childhood caries (ECC) • Setting: not specified • Study design: randomized clinical trials • Timeframe for follow-up: not specified 																
Participants	<p>Number of participants: 3,016 participants</p> <p>Age (mean/mode/range):</p> <p>Gender: not specified</p> <p>Details of any additional relevant participant characteristics:</p>																
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Weinstein 2004 US</td> <td>RCT</td> <td>n = 240 mothers of infants aged 6-18 months</td> <td>Local people trained in MI counselling</td> <td>MI + DHE (pamphlet + video) + fluoride</td> <td>DHE (pamphlet + video) + fluoride</td> <td>1 (45 minute)</td> <td>New carious lesion,</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest	Weinstein 2004 US	RCT	n = 240 mothers of infants aged 6-18 months	Local people trained in MI counselling	MI + DHE (pamphlet + video) + fluoride	DHE (pamphlet + video) + fluoride	1 (45 minute)	New carious lesion,
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest										
Weinstein 2004 US	RCT	n = 240 mothers of infants aged 6-18 months	Local people trained in MI counselling	MI + DHE (pamphlet + video) + fluoride	DHE (pamphlet + video) + fluoride	1 (45 minute)	New carious lesion,										

Parameter	Extraction items							
					varnish recommendation	varnish recommendation	MI session Follow-up at 12 months	mean (SD) DHE: 1.91 (4.8) MI: 0.71 (2.8) (P < .01) MI < DHE MI showed promise
	Weinstein 2006 Canada	RCT	n = 240 mothers of infants aged 6-18 months	Local people trained in MI counselling	MI + fluoride varnish recommendation	DHE + fluoride varnish recommendation	1 (45 minute) MI session Follow-up at 24 months	Infants with new carious lesion (carious or restored surfaces), % DHE: 52 MI: 35.2 MI < DHE significantly less new caries with MI
	Harrison 2007 Canada *	RCT	n = 205 mothers of South Asian children aged 6-18 months (n=105 intervention; n=100 control)	Local people trained in MI counselling	MI + DHE (pamphlet + video) + fluoride varnish recommendation	DHE (pamphlet + video) + fluoride varnish recommendation	1 (45 minute) MI session Follow-up at 24 months	Cariou, missing, or restored surfaces, mean (SD) DHE: 7.59 (14.2) MI: 3.35 (7.8) MI < DHE Cariou surface,

Parameter	Extraction items							
								<p>mean (SD) DHE: 2.91 (5.6) MI: 2.03 (4.9) 46% lower rate with MI</p>
	Ismail 2011 US	RCT	n = 599 caregivers of children aged 0- 5 years (n=299 intervention; n=300 control)	Interviewer trained in applying motivational interviewing principles (MI)	MI + DHE (DVD)	DHE (DVD)	1 (40 minute) MI session Follow-up at 24 months	<p>New carious lesion, mean (SD) DHE: 2.3 MI: 2.5 MI ~ control No significant effect with MI</p>
	Harrison 2012 Canada *	RCT	n = 241 women who recently had given birth or were at 12-34 wk of pregnancy (n=110 intervention; n=131 control)	Cree dental assistants who worked part-time in community dental clinics and trained local women	MI + DHE (pamphlet)	DHE (pamphlet)	2-7 MI sessions (duration not reported) Follow-up at 24 months	<p>Carious, missing, or restored surface, mean (SD) DHE: 14.3 (16.4) MI: 9.15 (1.91) Prevalence of caries, % DHE: 76 MI: 65 MI < DHE</p>

Parameter	Extraction items							
								MI impacted on severity of caries
	Manchanda 2014 India	RCT	n = 387 mothers with infants aged 6-18 months (n=137 intervention; n=128 comparison/n=122 control)	Local people trained in MI counselling	MI + DHE (PowerPoint template + pamphlet)	DHE (PowerPoint template + pamphlet) (Or control received no education)	1 MI session (duration not reported) Follow-up at 8 months	Cariou, missing, or restored teeth, mean (SD) Control: 1.17 (1.32) DHE: 0.39 (0.79) MI: 0.23 (0.58) MI < DHE, control MI effective in reducing caries
	Colvara 2018 Brazil	RCT	n = 320 mothers of children with mean age of 30 months (n=175 intervention; n=145 control)	Qualified professional (dentist) with MI experience	MI	DHE	1 (20-40 minute) MI session Follow-up at 23 months	Cariou, missing, or restored surface, mean (SD) DHE: 1.91 (4.45) MI: 0.86 (2.06) (P = 0.01) MI < DHE Incidence of caries, %

Parameter	Extraction items								
									DHE: 35.2 MI: 25.9 MI more effective
	Henshaw 2018 * US	RCT	N = 906 caregiver child dyads (pregnant women in third trimester or primary caregivers with child younger than 6 years) (n=310 intervention; n=596 control)	Local people trained in MI counselling	MI + DHE (brochure) + fluoride varnish recommendation + toothbrush/ toothpaste	DHE (brochure) + fluoride varnish recommendation + toothbrush/ toothpaste	1 (30 minute) MI session Follow-up at 24 months		Cariou, missing, or restored surface, mean (SD) DHE: 3.1 (8.1) MI: 3.1 (8.0) (P = 0.535) MI did not improve caries increment

MI: Motivational interviewing. DHE: Dental health education.

Countries (no. studies) (in alphabetic order): Brazil (1 study), Canada (3 studies), India (1 study), United States (3).

Setting/context

Setting (no. studies): not reported

Other relevant features: The number of MI sessions varied in the investigated studies (most used 1 session, 2 studies used more than 1). Various parameters were reported: carious, missing, and restored tooth surfaces; carious, missing, and restored teeth; incidence of caries, new carious lesions.

Databases and sources searched

Protocol prepared: No

- **If published, number and link:** not applicable

Number and names of databases: 4 databases were searched: Embase, Scopus, Cochrane, and PubMed

Other non-database sources:

Details of any other supplementary searches: a hand search for articles that were likely missed.

Parameter	Extraction items
	<ul style="list-style-type: none"> • Grey literature search: Not reported • Reference chasing: Not reported • Expert consultation: Not reported <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: up to March 23, 2019</p> <p>Search limits (e.g. date, language): English language filter as only studies in the English language were analyzed</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? No <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: The correlation coefficients between the search results of the 2 authors in the abstract and full-text levels were 0.93 and 1, respectively. If there was any disagreement between the 2 authors, the third author assessed the disagreement and made the final decision. <p>Extraction completed in duplicate: Not specified</p> <ul style="list-style-type: none"> • If yes, rate of agreement: <p>Funding of review: Not reported</p> <p>Conflicts of interest declared: None of the authors reported any disclosures</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: 2004 - 2018</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2004 (1 study), 2006 (1 study), 2007 (1 study), 2011 (1 study), 2012 (1 study), 2014 (1 study), 2018 (2 studies)</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 8</p> <p>Number of studies by study design: 8 RCTs</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p>

Parameter	Extraction items
Types of studies included	<p>Planned study design(s) to be included: RCTs</p> <p>Reasons for including study design(s) provided? Not reported, however, based on the methodology of the review author's previous systematic review</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Consolidated Standards of Reporting Trials tool</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> Not applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>Review authors reported that trials with at least 1 item designated to be at high risk of bias were regarded as having an overall high risk of bias, trials with unclear risk of bias for 1 or more key domains were considered to be at moderate risk of bias, and trials with low risk of bias in all domains were rated as having an overall low risk of bias.</p> <p>Therefore: High risk of bias (low quality) (k=7), unclear/moderate risk of bias (unclear/moderate quality) (k=1), low risk of bias (high quality) (k=none)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <p>Most of the articles were at high risk owing to lack of allocation concealment and blinding of participants and personnel. The inability to blind the counsellor explains this bias to some extent.</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No

Parameter	Extraction items
	<ul style="list-style-type: none"> • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes. Quality assessment and risk of bias addressed (page 657) relating to inadequate reporting of allocation sequencing and difficulties encountered with ‘blinding’ of personnel and participants. <p>Assessment of publication bias: Not reported</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors’ comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number): Authors reported the possibility of preparing a meta-analysis was judged, and an independent statistician and epidemiologist confirmed 3 studies for analysis. Meta-analysis was performed to compare the effect of MI treatment with that of DHE on the rate of carious, missing, and restored tooth surfaces in participants. For statistical analysis, the standard mean difference of continuous data was analysed at a 95% confidence interval using the random-effects model. Heterogeneity between the studies was investigated using Q statistic, I², and s². P < .05 was considered as indicative of significant heterogeneity. A forest plot was applied to illustrate the results of the meta-analysis and estimate the prevalence rate.(page 652)</p> <p>Authors’ justification for narrative synthesis or meta-analysis: Based on the varieties observed among the included studies, the data of only 3 articles could be collected for meta-analysis. (page 653)</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors’ justification for combining data in meta-analysis: • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. An accompanying forest plot and the weight of each study is provided. <p>For prospective cohort studies: not applicable</p>
Outcomes assessed	<p>List of authors’ primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: clinical rates of early childhood caries (ECC) • Primary outcome 2

Parameter	Extraction items
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List of authors' secondary outcomes: n/a

META-ANALYSIS FINDINGS

- **Primary outcomes:** clinical rates of early childhood caries (ECC)

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Rates of carious, missing, and restored tooth surfaces.	MI versus DHE	Clinical examination at 24 months follow-up	3 studies Harrison (2007), Harrison (2012), Henshaw (2018)	MD 2.83 (95% CI -0.83, 6.49)	0.130		n=525 intervention group n=827 comparison group In these comparisons using a random-effects model analysis the overall mean difference showed no significant difference between the groups - motivational interviewing is as effective as dental health education Heterogeneity was investigated using Q statistics Heterogeneity: $\tau^2 = 0.046$, $\chi^2 = 9.37$, $P = .009$	

Secondary outcomes: not applicable

NARRATIVE SYNTHESIS

Primary outcomes

Parameter	Extraction items
	<p>Review authors reported that researchers from the investigated studies reported various parameters to reveal the quantitative effectiveness of MI compared with DHE after the follow-up. Four studies (Harrison 2007, 2012, Henshaw 2018, Colvara 2018) compared carious, missing, and restored tooth surfaces between the studied groups; Harrison 2007 reported on carious surfaces, and Manchanda 2014 reported on the carious, missing, and restored teeth of the groups. Weinstein 2006 and Colvara 2018 measured the incidence of caries, Harrison 2012 assessed the prevalence of caries. Weinstein 2004 and Ismail 2011 reported on the emergence of new carious lesions. Authors concluded that MI was more effective in controlling caries compared with traditional education in most of the studies. Follow-up duration varied from 8 through 36 months among the studies.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes/No</p> <p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>The authors provide minimal comment on heterogeneity. Heterogeneity was measured in the meta-analysis using Q statistics and tau squared which is an estimate of the amount of true heterogeneity or variability between the effect sizes of the included studies.</p> <p>Researchers from the investigated studies reported various parameters to reveal the quantitative effectiveness of MI compared with DHE after the follow-up. 4 studies compared carious, missing, and restored tooth surfaces; 1 reported on carious surfaces; 1 reported on the carious, missing, and restored teeth; incidence of caries and prevalence of caries were reported in 2 studies; 2 studies reported on the emergence of new caries.</p> <p>The number of MI sessions varied in the investigated studies, and fidelity with the methods of MI delivery was discussed but could not be established clearly.</p> <p>Causes of heterogeneity investigated? No. The authors did not investigate causes of heterogeneity through formal methods.</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Heterogeneity	
Comments	

Gomersall *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	Gomersall <i>et al.</i> (2024)
Review title	Interventions with pregnant women, new mothers and other primary caregivers for preventing early childhood caries (Review)
Review coding	Pregnant and new mothers; early childhood caries; mixed providers;
Contributing primary studies	The information presented in this extraction form applies only to the 14/23 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): This review update examined the effects of interventions targeted at pregnant women, new mothers or other primary caregivers of infants in the first year of life, for preventing ECC (from birth to six years of age). Specifically, the intervention types include: 1) clinical interventions, 2) oral health education/promotion (such as infant and young child dietary advice (including relating to breastfeeding), child feeding practice advice, and oral hygiene advice for mothers and/or young children), and 3) policy and access to services. Only those related to question 2) are included in this umbrella review.</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Pregnant women and new mothers of young infants (up to 12 months) were the main participants in this review. Studies in which the intervention was provided to new mothers and other primary caregivers (e.g. fathers, grandmothers) of children in their first year of life were also considered. Studies involving new mothers or other primary caregivers of young children were only eligible if all the infants of randomised caregivers were younger than 12 months at baseline (i.e. just prior to when the intervention started). • Intervention: oral health education and/or promotion, such as support for breastfeeding, dietary advice for infants and young children or oral hygiene education, or dietary advice for mothers (including relating to vitamin intake); • Comparison: placebo; standard care; or another intervention with pregnant women, new mothers or other primary caregivers of infants in the first year of life, for preventing ECC. • Outcome: The primary outcome was the clinical measure of dental caries in infants or children up to six years of age. caries presence in primary teeth and/or cavitated lesions; dmfs; dmft; included the prevalence of caries (i.e. how many children had any caries), and severity/ burden of caries (how extensive the caries were per child) • Setting: not specified. Studies conducted in a mix of high-, middle- and low-income countries. • Study design: Randomised controlled trials (RCTs) and cluster-RCTs

Parameter	Extraction items															
Participants	<ul style="list-style-type: none"> Timeframe for follow-up: infants or children up to six years of age <p>Number of participants: N = 23,973 Totalled based on participant numbers reported for each of the 14 included studies:</p> <p>Age (mean/mode/range): pregnant women and/or new mothers, age not specified. Mean age of mothers ranged from 17 to 44 years of age in 11 included trials, 2 studies did not report maternal age, 1 reported age range as a proportion.</p> <p>Gender: mostly women, 1 trial included fathers</p> <p>Details of any additional relevant participant characteristics: 10 included studies included socioeconomically disadvantaged, 1 included mixed socioeconomic status, in remaining 3 studies participant socioeconomic status was undetermined</p>															
	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Chaffee 2013 Brazil</td> <td>cRCT</td> <td>N=715 mothers and pregnant women and their fetuses/infants n=360 intervention, n=355 standard care</td> <td>Healthcare workers who were trained in Brazilian infant feeding guidelines.</td> <td>Dietary advice relating to breastfeeding, timing of weaning and a healthy weaning diet (e.g. low in sugar) No specific oral hygiene message</td> <td>Standard care</td> <td>Timing and frequency of pre and postnatal visits not reported. Follow-up at 3 years</td> <td>caries presence in primary teeth, dmfs;</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest	Chaffee 2013 Brazil	cRCT	N=715 mothers and pregnant women and their fetuses/infants n=360 intervention, n=355 standard care	Healthcare workers who were trained in Brazilian infant feeding guidelines.	Dietary advice relating to breastfeeding, timing of weaning and a healthy weaning diet (e.g. low in sugar) No specific oral hygiene message	Standard care	Timing and frequency of pre and postnatal visits not reported. Follow-up at 3 years
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest									
Chaffee 2013 Brazil	cRCT	N=715 mothers and pregnant women and their fetuses/infants n=360 intervention, n=355 standard care	Healthcare workers who were trained in Brazilian infant feeding guidelines.	Dietary advice relating to breastfeeding, timing of weaning and a healthy weaning diet (e.g. low in sugar) No specific oral hygiene message	Standard care	Timing and frequency of pre and postnatal visits not reported. Follow-up at 3 years	caries presence in primary teeth, dmfs;									
Description of Interventions/ phenomena of interest																

Parameter	Extraction items							
	Feldens 2007 Brazil	RCT	N=500 women (new mothers) and their infants n=200 intervention, n=300 control	Trained field workers	A home visit dietary intervention known as the 'Ten Steps to Healthy Feeding of Younger Children'. No specific advice about oral hygiene was provided.	Routine assistance/standard care delivered by their paediatricians in the health service	Monthly advice from birth up to six months; thereafter, advice at 8, 10 and 12 months postpartum (> 6 months intervention duration) Follow-up at 4 years	caries presence in primary teeth, dmfs, dmft, d1 + mfs > 5
	Watt 2009 UK	RCT	N=312 new mothers and their infants n=157 intervention, n=155 control	Local volunteers trained to provide home-based non-judgemental support and practical assistance on infant feeding	5 home visits (mean length 60 minutes per visit)	Standard care (professional support from health visitors and GPs).	Delivered during the first year of life, over a nine-month period	caries presence in primary teeth
	Birungi 2015 Uganda	cRCT	N=765 pregnant women and their fetuses n=396 intervention, n=369 control	trained workers from the local community	Individual tailored home-based peer counselling focused on promoting exclusive breastfeeding.	Standard care delivered by public health services.	One visit conducted during late pregnancy, and four visits from weeks one to ten after birth. Follow-up at 5 years	caries in primary teeth, dmft;

Parameter	Extraction items							
	Kramer 2001 Belarus	cRCT	N=17,046 women (new mothers) and their infants n=8865 intervention, n=8181 control	healthcare worker	Breastfeeding promotion intervention that emphasised healthcare worker assistance with initiating and maintaining breastfeeding, and provided lactation and postnatal breastfeeding support.	Standard care (i.e. usual infant feeding practices and policies)	Started during labour; continued through the immediate postpartum period (hospital stay and postnatal visits) > 6 months	caries presence in primary teeth, dmft;
	Lapinleimu 1995 Finland	RCT	N= 1054 families (including mother and/or father primary caregivers) with 1062 infants aged 7 months. n=537 families with n=540 infants in intervention, n=517 families with n=522 infants in control group	Dietician	individually tailored instructions were given to adjust fat intake of the children, and encouraged to continue breastfeeding as long as they found it feasible.	Standard care/diet, the parent(s) received written information about a well-balanced and healthy diet for infants,	Dietician sessions lasted 20-25 minutes and occurred at every visit (7, 8, 10, and 13 months)	caries presence in primary teeth
	Batliner 2018 US	RCT	579 mother-newborn dyads	Local people, who lived on the trial	MI + Enhanced community services.	Enhanced community services	Initially shortly after childbirth and subsequent	caries presence in primary

Parameter	Extraction items							
		n=301 intervention, n=299 comparison	reservation or nearby	2 topics of 8 options addressed at each visit		MI sessions and follow-up when the child was 6, 12, and 18 months old	teeth; dmfs	
Hallas 2015 US	RCT	N= 94 women (new mothers) and their infants n=47 intervention, n=37 control	DVD delivered at the bedside with routine newborn education by nurses, lactation consultant, physicians, and residents.	8-minute newborn oral health educational DVD, designed by the investigating team	Standardised 8-minute DVD on nutrition for newborns and infants	during mothers' postnatal hospital stay Follow-up at 6 and 12 months	any caries presence in primary teeth (narrative synthesis only)	
Harrison 2012 Canada	cRCT	N=272 Cree women (pregnant women or new mothers) and their infants n=131 intervention, n=141 control	Aboriginal women living in the study communities who were trained in the motivational interviewing (MI) technique	one-on-one oral health education counselling intervention.	Standard health education and promotion provided by local health clinics.	started during pregnancy (1 counselling session), with six additional sessions delivered after birth, up to the child's second birthday, at the time of routine infant wellness clinic visits Follow-up at at least 30 months	caries presence in primary teeth	

Parameter	Extraction items							
	Muhoozi 2017 Uganda	cRCT	N=511 caregivers (mothers or grandmothers) and infants n=263 intervention, n=248 control	An education team of 4 trained persons in nutrition	nutrition and hygiene education, including oral healthcare for mothers of new babies,	Standard care	The intervention started when infants were between six and eight months of age and was implemented for six months. Follow-up at 3 years	caries presence in primary teeth (top front four teeth only);
	Pereira 2021 Brazil	RCT	N=75 mother-child dyads n=40 mother-child dyads intervention, n=30 mother-child dyads control	dental practitioners	a behaviour-oriented, photography-aided two-stage education programme addressing nutritional, behavioural, lifestyle and familial factors that affect child oral health in addition to usual care	Usual care provided by the hospital	one-on-one conversations, for around 25 minutes, delivered twice, immediately following and six months after the birth Follow-up at 1 year	caries presence in primary teeth (any white spots)
	Plutzer & Spencer 2008 Australia	RCT	N=649 pregnant women and their foetuses n=165 intervention group 1,	paediatricians and family physicians in well-childcare clinics	Group 1: oral health and nutrition advice infant oral health education, and	Standard care	Started during pregnancy (5 to 7 months), continued until 12 months postpartum	caries presence in primary teeth; dmfs;

Parameter	Extraction items							
			n=162 intervention group 2, n=322 control group		advice about a healthy diet and feeding practices, reinforced at 6 months with telephone interview Group 2: same without telephone interview advice		Follow-up at 6 years	dmft; SIC index;
	Veronneau 2010 Canada	RCT	N=821 women and their infants n for women randomised to intervention and control not reported	dental hygienists	community-based health education intervention aimed at preventing caries in young children	Standard care	four sessions at 6 month intervals postpartum Follow-up not specified	any caries present in primary teeth; dmfs index (narrative synthesis only)
	Yu 2021 Hong Kong	RCT	N=580 families and 436 toddlers n=294 intervention families n=286 control families	trained dental professionals	behavioural and educational counselling with oral health pamphlets, individual verbal oral hygiene instruction with demonstration,	Same oral health pamphlets	delivered to parents during pregnancy and the child's first two years of life. Follow-up at 2 and 3 years	caries presence in primary teeth;

Parameter	Extraction items								
					plus feeding and dietary habits counselling, and reinforcement messages				

Review authors assessed interventions intended to prevent tooth decay in young children (from birth to six years), provided to women during pregnancy or to new mothers and other primary caregivers of infants under 12 months.

Setting/context

Countries (no. studies) (in alphabetic order): Australia (1 study), Belarus (1 study), Brazil (3 studies), Canada (2 studies), Finland (1 study), Hong Kong (1 study), Uganda (2 studies), UK (1 study), US (2 studies)

- **Setting (no. studies):** not specified. Studies conducted in a mix of high-, middle- and low-income countries.

Other relevant features:

Protocol prepared: Yes

- **If published, number and link:** CD012155
- [Interventions with pregnant women and new mothers for preventing caries in children - Riggs, E - 2016 | Cochrane Library](#)

Databases and sources searched

Number and names of databases: 6 databases included

Cochrane Oral Health's Trials Register

Cochrane Pregnancy and Childbirth Group Trials Register

Cochrane Central Register of Controlled Trials (CENTRAL; 2023; Issue 1) in the Cochrane Library

MEDLINE Ovid

Embase Ovid

CINAHL EBSCO (Cumulative Index to Nursing and Allied Health Literature)

Other non-database sources: trial registries were searched for ongoing studies

US National Institutes of Health Ongoing Trials Register, ClinicalTrials.gov

World Health Organization International Clinical Trials Registry Platform

Details of any other supplementary searches:

- **Grey literature search:** No

Parameter	Extraction items
	<ul style="list-style-type: none"> • Reference chasing: Yes of all references cited in included papers • Expert consultation: Yes for unpublished trials <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: up to 3 January 2023 when search conducted</p> <p>Search limits (e.g. date, language): Search conducted without language, publication year or publication status restrictions.</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Not applicable <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported <p>Funding of review: supported by the National Institute for Health Research (NIHR), UK</p> <p>Conflicts of interest declared: authors stated they had none to declare</p> <p>If declared, how conflicts of interest were managed:</p>
<p>Date Range (years) of included studies</p>	<p>Date range for included studies relevant to this overview of reviews: 1995 - 2021</p> <p>Exact years of publication of studies relevant to this overview of reviews: e.g. 1995 (1 study), 2001 (1 study), 2007 (1 study), 2008 (1 study), 2009 (1 study), 2010 (1 study), 2012 (1 study), 2013 (1 study), 2015 (2 studies), 2017 (1 study), 2018 (1 study), 2021 (2 studies).</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 14</p> <p>Number of studies by study design: RCT (9 studies), cRCT (5 studies)</p> <p>Funding of primary studies: Yes. Funding bodies listed by the trials were non-commercial organisations (e.g. government-funding bodies, health services or other not-for profit foundations) in 13 included studies, Colgate Oral Care and Johnson & Johnson Pacific Company provided some funding for one trial (Plutzer 2008)</p> <p>Conflicts of interest of primary studies: 10 studies reported no conflicts of interest, 4 did not report any information.</p>
<p>Types of studies included</p>	<p>Planned study design(s) to be included: RCTs/cRCTs</p> <p>Reasons for including study design(s) provided? Yes</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> If yes, describe the reasons(s): This is an update of a Cochrane review first published in 2019, that has not been previously updated. <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: the Cochrane domain-based, two-part Risk of Bias tool as described in Chapter 8 of the Cochrane Handbook for Systematic Reviews of Interventions</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> Concealment of allocation: Yes Blinding of assessors: Yes Sequence allocation (individual vs group randomisation): Yes Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: Not applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors did not provide an overall assessment of risk of bias for each trial. The risk of overall bias in the included trials was mixed, with most of the included trials having some methodological weaknesses. Authors reported a general lack of methodological detail provided to assess specific aspects of risk of bias, leading to many 'unclear' judgements.</p> <p>12 of the included trials were judged as being at low risk of selection bias, and selection bias risk was unclear in the remaining trials. All of the included trials were assessed as being at high risk of performance bias due to it not being possible to blind participants and personnel to the intervention assessed. Only one of the included trials was assessed as being at low risk of attrition bias, due to moderate or high numbers of infants not being available for the caries assessments and/or differences in the proportions of infants 'lost to follow-up' across the groups compared, or lack of details regarding dropouts, in the remaining trials. For the majority of the included trials(11 of 14), review authors were uncertain about the risk of selective reporting bias, and judged this as being unclear, due to lack of access to protocols preventing confident assessment of the degree of divergence between planned and actual analyses reported.</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> Only low risk of bias RCTs included in review: No

Parameter	Extraction items
	<ul style="list-style-type: none"> • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Review authors reported that where possible, they planned to use multiple sources of data, including data from unpublished trials, if available, to assess reporting biases. For meta-analysis including more than 10 studies, they planned to generate funnel plots and assess publication bias according to the recommendations described in the <i>Cochrane Handbook for Systematic Reviews of Interventions</i>. However, all analyses included only between one and five studies. • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): Review authors sought unpublished trials by contacting experts in the field and attempted to contact the author(s) of included studies for clarification or details of missing data.
<p>Method of analysis</p>	<p>Authors description of method of analysis (include page number): The review authors conducted meta-analyses for the prespecified review outcomes and extracted the raw data from the trial reports. For dichotomous outcomes, risk ratios (RRs) were calculated for the proportional difference between the intervention and comparison groups, along with 95% CIs. For continuous outcomes, they extracted and used the mean values and standard deviations (SD) reported in the studies in order to express the estimate of effect as a mean difference (MD) with a 95% confidence interval (CI). The unit of analysis for the primary outcome in this review was the child.</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: Statistical analysis was carried out using Review Manager 5 software. Mean differences (using standardised mean differences where studies used different scales) for continuous outcomes, and combined relative risks for dichotomous outcomes, using a fixed-effect model (as there were only two or three studies in each analysis). Meta-analysis combining outcome data only from studies evaluating similar interventions (as standalone or combined interventions) against placebo or standard care was performed. • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. Sample sizes and event rates of included cluster-randomised trials were adjusted using an estimate of the intra-cluster correlation coefficient (ICC) derived from the trial (if possible), from a similar trial or from a study of a similar population. Authors included both cluster-randomised trials and individually-randomised trials in meta-analysis following careful consideration of whether it was reasonable to

Parameter	Extraction items
	<p>combine the results. They acknowledged heterogeneity in the randomisation unit and performed a subgroup analysis to investigate the effects of the randomisation unit in the analysis that included cluster and individually randomised trials.</p> <p>For prospective cohort studies: Not applicable</p> <ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): Yes/No • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): • Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes/No <p>List of authors' primary outcomes: The primary outcome was the clinical measure of dental caries in infants or children up to six years of age following oral health education/promotion interventions.</p> <p>Interventions/comparisons in included trials:</p> <ol style="list-style-type: none"> 1)Child diet and feeding practice versus standard care; 2)Breastfeeding promotion and support versus standard care; 3)Child diet advice compared with standard care; 4)Oral hygiene, child diet and feeding practice advice versus standard care.
Outcomes assessed	<ul style="list-style-type: none"> • Primary outcome measures <ul style="list-style-type: none"> ○ caries presence in primary teeth (any, yes/no; including non-cavitated (white spot lesion) and/or cavitated lesions); ○ dmfs (decayed missing and filled surfaces, and index expressing the total number of decayed missing or filled surfaces in primary dentition (five per posterior tooth and four per anterior tooth) as a score (range 0 to 80 surfaces)); and ○ dmft (decayed missing and filled teeth, and index expressing the total number of teeth affected by tooth decay (missing or filled) in the primary dentition as a score (range 0-20)). <p>Variants of dmfs and dmft, were included as primary outcomes; the d(e)fs and d(e)ft ('e' indicates an extracted tooth), hence the prevalence of caries (i.e. how many children had any caries), and severity/burden of caries (how extensive the caries were per child) were included.</p> <p>List of authors' secondary outcomes: not applicable</p>

Parameter	Extraction items
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META-ANALYSIS FINDINGS

- **caries presence in primary teeth** (Risk ratio with 95% CI)

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Caries presence in primary teeth (children assessed at 3-5 yrs)	Diet and feeding practice advice for infants and young children versus standard care	caries presence	3 studies (782 participants): Chaffee 2013; Feldens 2007; Watt 2009	RR 0.85 [0.75, 0.97]	0.02	11%	Intervention probably reduces slightly the risk of caries presence in primary teeth in children aged three to five years.	Mod GRADE
Caries presence in primary teeth (children assessed at 5-6 yrs)	Breastfeeding promotion and support versus standard care	caries presence	2 studies (1148 participants): Kramer 2001; Birungi 2015	RR 0.96 [0.89 to 1.03]	0.22	0%	Intervention may result in little to no difference in the risk of caries presence in primary teeth amongst children aged five to six years	Low GRADE
Caries presence in primary	Dietary advice for infants and young children	caries presence	1 study (148 participants) Lapinleimu 1995	RR 1.08 [0.34 to 3.37]	0.90	Not applicable	The evidence is very uncertain about the effect of dietary advice for infants and	Very low GRADE

Parameter	Extraction items								
	teeth (children assessed at 3 yrs)	compared with standard care						young children compared with standard care on the risk of caries presence in primary teeth in children aged three years	
	Caries presence in primary teeth (children assessed at 1-6 yrs)	Oral hygiene education combined with diet and feeding practice advice for infants and young children compared with standard care	caries presence	5 studies (1326 participants) Batliner 2018; Harrison 2012; Pereira 2021; Plutzer & Spencer 2008; Yu 2021.	RR 0.73 [0.50 to 1.07]	0.10	83%	Oral hygiene, diet and feeding advice compared with standard care may result in little to no difference in risk of caries presence in primary teeth amongst children aged one to six years, but the evidence is very uncertain	Very low GRADE

- **dmfs** (decayed missing and filled surfaces, and index expressing the total number of decayed missing or filled surfaces in primary dentition) as a score (range 0-80 surfaces, lower is better)

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
dmfs (children assessed)	Diet and feeding practice advice for infants and	mean dmfs index score	2 studies (757 participants) Chaffee	MD -0.29 [-0.58, 0.00]	0.05	0%	Lower score in intervention suggests it may reduce mean dmfs	Low GRADE

Parameter	Extraction items									
	at 1-3 yrs)	young children versus standard care		2013; Feldens 2007.					slightly in children aged one to three years	
	dmfs	Breastfeeding promotion and support versus standard care							Not assessed	
	dmfs	Dietary advice for infants and young children compared with standard care							Not assessed	
	dmfs (children assessed at 3 yrs)	Oral hygiene education combined with diet and feeding practice advice for infants and young children compared with standard care	mean dmfs index score	2 studies (657 participants) Batliner 2018; Plutzer & Spencer 2008	MD -0.87 [-2.18, 0.43]	0.19	0%		An oral hygiene, diet and feeding advice intervention compared with standard care may result in little to no difference in mean dmfs in children aged three to six years	Low GRADE

- **dmft** (decayed missing and filled teeth, and index expressing the total number of teeth affected by tooth decay (missing or filled) in the primary dentition as a score (range 0-20)).

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95%	Additional information
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Parameter	Extraction items								
								CI, p value, heterogeneity	
dmft (children assessed at 4 yrs)	Diet and feeding practice advice for infants and young children versus standard care	mean dmft index score	1 study (340 participants) Feldens 2007	MD -0.90 [-1.85, 0.05]	0.06	Not applicable		The evidence from 1 study is very uncertain about the effect of diet and feeding practice advice for infants and young children versus standard care on mean dmft in children aged four years	Very low GRADE
dmft (children assessed at 5-6 yrs)	Breastfeeding promotion and support versus standard care	mean dmft index score	2 studies (652 participants) Birungi 2015; Kramer 2001	MD -0.12 [-0.59, 0.36]	0.63	0%		Breastfeeding promotion and support compared with standard care may result in little to no difference in mean dmft in children aged five to six years	Low GRADE
dmft	Dietary advice for infants and young children compared with standard care							Not assessed	
dmft (children assessed at 6 yrs)	Oral hygiene education combined with diet and feeding	mean dmft index score	1 study (187 participants) Plutzer & Spencer 2008	MD -0.30 [-0.96, 0.36]	0.37	Not applicable		Data from 1 trial suggested that an oral hygiene, diet and feeding advice intervention	Low GRADE

Parameter	Extraction items								
		practice advice for infants and young children compared with standard car						compared with standard care may result in little to no difference in mean dmft, assessed in children at age six years	

Secondary outcomes Not applicable

Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable

Authors' comment on potential impact of heterogeneity on results and quality of evidence: There was wide variation across the included trials in the number of included participants. For all primary outcome meta-analyses, authors undertook sensitivity analyses, where relevant, to assess the robustness of the results by excluding studies assessed as high risk of bias for two or more domains.

Causes of heterogeneity investigated? Yes

This review includes diverse interventions and authors expected heterogeneity of intervention content, outcomes and outcome measures. Authors planned to consider the feasibility of performing meta-analysis on a subgroup of the studies once the data were extracted and the Risk of bias assessment had been completed. They tested for heterogeneity using a Chi2 test where $P < 0.1$ gives an indication of the presence of heterogeneity, with inconsistency quantified and represented by the I^2 statistic. The thresholds for interpretation were as follows:

- 0% to 40%: might not be important;
- 30% to 60%: may represent moderate heterogeneity;
- 50% to 90%: may represent substantial heterogeneity;
- 75% to 100%: considerable heterogeneity.
- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**
- **If yes, provide a brief indication of the extent of heterogeneity in the relevant results:**

Heterogeneity

Parameter	Extraction items
Comments	Authors evaluated the certainty of the evidence for the primary outcome measures, caries presence in primary teeth, dmfs index score, and dmft index score, amongst children aged 0 to 6 years, using GRADE

Gurav *et al.* (2022) – Extraction form

Parameter	Extraction items
First author and year of publication	Gurav <i>et al.</i> (2022)
Review title	Effectiveness of Oral Health Educational Methods among School Children Aged 5–16 Years in Improving their Oral Health Status: A Meta-analysis
Review coding	Provider: Dental health professionals. Participants: School children.
Contributing primary studies	The information presented in this extraction form applies to the 9/9 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): In school children aged 5–16 years are the newer oral health educational methods as compared to traditional oral health talk effective in improving oral hygiene status, plaque and gingival status, and dental caries status? (Table 1, p339)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: school children (5–16 years) both girls and boys. • Intervention: OHE methods including demos/videos/posters/ presentations/activities/oral hygiene instructions given by dental professionals only (experimental group). • Comparison: traditional OHE method including oral health talk or oral health counseling (control group). • Outcome: dental plaque index, gingival index, OHI-S, and decayed, missing, filled teeth (DMFT)/decayed missing filled surface (DMFS) index at different intervals/follow-ups. • Setting: Not stated • Study design: experimental, clinical and randomized controlled trial (RCTs) studies, controlled clinical trial, and clinical trials. • Timeframe for follow-up: follow-up term kept at 1 month and 18 months.
Participants	<p>Number of participants: 1,100</p> <p>Age (mean/mode/range): 5-16 years</p> <p>Gender: Not stated</p>

Parameter	Extraction items
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Details of any additional relevant participant characteristics:

Target group: Children and adolescents 5-16 years old

Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.

Overview of relevant characteristics of primary studies included in systematic review:

**Description of Interventions/
phenomena of interest**

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes
Chandrashekar 2012 India	RCT	Baseline = 80 Follow-up = 77 Aged 15 years	Dentist	Dental health education (DHE) by a qualified dentist at 3 months interval using the audio-visual aids	Control group with no subsequent DHE after the initial health education offered at the time of screening	Reinforcement period: 3-month interval Follow-up period: 6 months	Mean Oral Hygiene Index Status (OHI-S), Plaque Index were assessed
John 2013 India	RCT	Baseline: 50 Follow-up = Not stated Aged 4-6 years	Senior dental residents (trained by the same dentist)	Children were shown a drama enacted by the senior dental residents (trained by the same dentist) disguised as cartoon characters such as Dora,	Oral health talk was delivered by the dentist	Follow-up period: 3 months	Mean difference between pre- and post-Simplified Debris Index (DI-S), a part of the Oral Hygiene Index

Parameter	Extraction items							
					Mickey Mouse, Power Ranger and a devil, for about 20 minutes			modified for the primary dentition
	Chandrashekar 2014 India	RCT	Baseline: 80 Follow-up: 71 Aged 15 years	Dentist	DHE by a qualified dentist at 3 months interval using the audio–visual aids	Control group with no subsequent DHE after the initial health education offered at the time of screening	Reinforcement period: 3-month interval Follow-up period: 6 months	Mean Oral Hygiene Index Status (OHI-S), Plaque Index, Gingival Index, and DMFS index were assessed
	Angelopoulou 2015 Greece	Two arm parallel group prospective clinical trial	184 Aged 10-11 years	Dentist and teacher	Experiential learning (EL) group had lecture on oral health issues by a dentist along by their teacher using the program’s manual along with extramural visits, for example, to the dentist, to	Traditional lecturing (TL) group had only a lecture on oral health issues by a dentist	Follow-up period: 18 months	Dental plaque using a modification of Hygiene Index of Lindhe, that does not use a disclosing agent and gingivitis using the GI-S by median

Parameter	Extraction items							
					the vet, to the pharmacy or supermarket and which was presented by the students in the classroom using different forms such as theatrical play, posters, songs, crafts, role playing, etc.			(IQR) Mean dental caries (DMFT), according to the diagnostic criteria of the British Association of Community Dentistry
	Kumar 2015 India	RCT	Baseline: 60 Follow-up: 55 Aged 7-10 years	Not stated	Educated with both flash card and game based (connect the dots) method	Educated with conventional method	Reinforcement period: Once daily for a period of one week Follow-up period: 1 and 3 months	Mean Simplified Debris Index (DI-S)
	Malik 2017 India	RCT	Baseline: 150 Follow-up: 150 Aged 8-12 years	Dental examiners	Dental examiners gave a 15-minute lecture on oral health, brushing, and diet using	Dental examiners instructed using the game-based teaching method (crosswords)	Reinforcement period: Once a day for 7 days Follow-up period: 1 and 3 months	Mean dental plaque scores by Turesky, Gilmore, Glickman modification

Parameter	Extraction items							
					PowerPoint presentation	and quizzes) combined with PowerPoint		of the Quigley–Hein index
	Sadana 2017 India	Double-blind randomized controlled field trial	150 Aged 10-12 years	Not stated	Group II: verbal communication but along with self-educational pamphlets Group III: oral health education through verbal communication along with audiovisual method shown in the schools	Group I: oral health education was verbal communication	Follow-up: 6 weeks	Mean plaque score was recorded using Silness and Loe Plaque Index
	Umamaheswari 2017 India	RCT	Baseline: 60 Follow-up: 60 Aged 5-7 years	Not stated	The Good Behavior Game group	The conventional health education group	Reinforcement period: Once daily for 7 days Follow-up period: 3 months	Mean difference of Simplified Debris Index (DI-S) proposed by Greene and Vermillion and modified by Greene

Parameter	Extraction items							
	Al Bardaweel 2018 Syria	Clustered RCT	Baseline: 220 Aged 10-11 years Follow-up: 200	Not stated	Oral health education through leaflets	Oral health education through an E-learning program	Follow-up: 3 months	Mean Plaque Index and Gingival Index scores

Countries (no. studies) (in alphabetic order):

Greece (1 study - Angelopoulou 2015)

Setting/context

India (7 studies - Chandrashekar 2012, John 2013, Chandrashekar 2014, Kumar 2015, Malik 2017, Sadana 2017, Umamaheswari 2017)

Syria (1 study - Al Bardaweel 2018)

Setting (no. studies): All 9 primary studies are in a school-based setting

Other relevant features:

Protocol prepared: Yes

- **If published, number and link:**

- Number: CRD42020156997

- Link: <https://www.crd.york.ac.uk/PROSPERO/view/CRD42020156997>

Databases and sources searched

Number and names of databases:

4 databases

- PubMed/MEDLINE
- DOAJ
- Cochrane Central Register of Controlled Trials
- Web of Science

Other sources:

- ClinicalTrials.gov database

All databases were searched until October 2019.

Other non-database sources:

N/A

Parameter	Extraction items
	<p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: Yes • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: Until October 2019.</p> <p>Search limits (e.g. date, language): Publications from 2010-2019 written in English and available as full text.</p> <p>Are search limits justified/appropriate? Not reported</p> <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not stated. Although the method's section notes that the Cohen's Kappa test was applied to assess the inter-reviewer reliability for search agreement. <p>Extraction completed in duplicate: Yes</p> <p>"The following data were extracted from the included studies (when available) by two independent reviewing authors: study identification number, authors, study design, follow-up, number of subjects, age, gender, type of OHE for intervention and control groups, mean plaque, gingival, OHI-S index, DMFT score, effect size, and author's conclusions were recorded."</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: None</p> <p>Conflicts of interest declared: None</p> <p>If declared, how conflicts of interest were managed: N/A</p>
<p>Date Range (years) of included studies</p>	<p>Date range for included studies relevant to this overview of reviews: 2012-2018</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2012 (1 study), 2013 (1 study), 2014 (1 study), 2015 (2 studies), 2017 (3 studies), 2018 (1 study)</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 9 studies</p> <p>Number of studies by study design: RCT (7 studies), Cluster RCT (1 study), Two arm parallel group prospective clinical trial (1 study)</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p>

Parameter	Extraction items
Types of studies included	<p>Planned study design(s) to be included: Prospective cohort, controlled clinical trial, clinical trial, and RCT</p> <p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): N/A <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane Collaboration Tool for RCTs was executed for quality assessment of the selected studies by using the random sequence generation, allocation concealment, blinding of participants, incomplete outcome data, selective reporting, and other bias.</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: N/A</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality): The authors provided an overall assessment of risk of bias for each trial. The HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have, as reported:</p> <ul style="list-style-type: none"> - High risk of bias (k=2) (Angelopoulou, 2015; Al Bardaweel, 2015) - Moderate risk of bias (k=4) (Malik, 2017; John, 2013; Kumar, 2015; Sadana, 2017) - Low risk of bias (k=3) (Chandrashekar, 2012; Chandrashekar, 2014; Umamaheswari, 2017) <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes

Parameter	Extraction items
	<p>“With the exception of three studies,(Chandrashekar 2014, Chandrashekar 2012, Umamaheswari, 2017) none of the other studies had rigorous and classic study design, impeding as to blinding of the participants and outcome assessors which was not implemented.”p346</p> <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> <li>• If yes, how was publication bias assessed? “Graphical representation was done with forest plots and funnel plots to envision the differences between groups and publication bias.”p340 [Publication bias was only assessed for Plaque Index] “Publication bias was not assessed for OHI-S, gingival, debris, and dental caries outcomes because more than five studies are required to detect funnel plot asymmetry.”p341 <li>• If yes, authors’ comment of likelihood and magnitude of publication bias (include page number(s)): Not reported
Method of analysis	<p>Authors description of method of analysis (include page number): Nine articles were included for qualitative synthesis and seven were eligible for meta-analysis. The meta-analysis was done using Review Manager 5.3 software. p340</p> <ul style="list-style-type: none"> <li>• A random-effect model was used to assess the plaque outcome “The studies with groups that compared OHE intervention vs controls concerning the plaque outcome (Silness and L öe Plaque Index) were evaluated [using] a random-effects model analysis.” p341 <li>• A fixed-effect model was used to assess the oral hygiene status outcome “Two studies (Chandrashekar 2014; Chandrashekar 2012) in which there were OHE intervention groups vs control groups analyzing oral hygiene status outcome (OHI-S). On deducing the forest plot we found that the cumulative mean difference was –0.37 (–0.74, 0.00) with fixed effect model based on the heterogeneity value of I2 indicating the newer methods (audio–visual aids) of OHE was more effective over traditional oral health interventions when improving oral hygiene status (Fig. 6).” p341 <li>• A random-effect model was used to assess the Simplified Debris Index outcome “In the random-effects model analysis, two studies (John, 2013; Kumar, 2015) were Simplified Debris Index was analyzed, showed a significant difference oral hygiene status between the two groups, with reduced mean debris score showed that interventions (drama/plays and games based OHE) being more effective group than the controls with cumulative mean difference as –0.20 (–0.33, –0.07) (Fig. 7).” p341 <li>• A random-effect model was used to assess the gingivitis outcome

Parameter	Extraction items
	<p>“Two studies(Bardaweel, 2015; Chandrashekar 2014) in which gingivitis outcome (Silness and Löe) were analyzed using random-effects model, showed a significant difference in improving and reducing gingivitis between the groups with mean difference of -0.00 ($-0.54, 0.54$), thus favoring neither the interventional nor the control group (Fig. 8).” p341</p> <ul style="list-style-type: none"> • A random-effect model was used to assess the DMFT/DMFS Index outcome <p>“The DMFT/DMFS Index was assessed by two studies (Chandrashekar 2014; Angelopoulou, 2015) using random-effects model, showed a significant difference in the change in gingivitis between the groups with mean difference of -0.17 ($-0.73, 0.38$).” p431</p> <p>Authors’ justification for narrative synthesis or meta-analysis:</p> <p>The authors state "A quantitative synthesis (meta-analysis) was done on the selected seven studies [out of nine]", but don't provide a clear rationale for why meta-analysis was chosen over narrative synthesis.</p> <p>In the discussion, they note that "Previous studies inspired us to conduct this meta-analysis which we contributed to, by involving dental caries as an assessment outcome, articulating and following a stringent selection criterion to reduce any infiltration of bias, keeping the age group of children specific to 5–16 years (common school age across the globe), and conducting subgroup analyses for all the selected outcomes". This suggests they chose meta-analysis to build on previous work and provide quantitative synthesis of specific outcomes.</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors’ justification for combining data in meta-analysis: <p>The authors provide minimal explicit justification for combining data.</p> <p>They grouped studies based on similar outcomes: "The studies with groups that compared OHE intervention vs controls concerning the plaque outcome (Silness and Löe Plaque Index) were evaluated", suggesting they combined studies using the same measurement indices.</p> <p>For some outcomes, they note when meta-analysis couldn't be conducted: "Malik et al. did not have any counter study for comparison for Tuskegy–Gilmore Index to measure Plaque Index, hence it was not possible to include them in the meta-analysis" and "The study conducted by Umamaheswari et al. used ordinal scale for outcome of interest so was not included in the meta-analysis". This indicates they only combined studies with comparable measurement scales and sufficient comparison studies.</p> <ul style="list-style-type: none"> • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes <p>Yes, the authors used appropriate weighting techniques with adjustments for heterogeneity:</p> <p>They state in the methods: "Standardized mean difference and effect size were interpreted as primary summary measures", indicating use of standardized measures to account for different scales.</p> <p>They appropriately selected between random and fixed effects models based on heterogeneity: "In these comparisons random-effects model analysis, the mean cumulative difference showed no significant finding" for plaque index, and "we found that the cumulative mean difference was -0.37 ($-0.74, 0.00$) with fixed effect model based on the heterogeneity value of I^2" for OHI-S outcome.</p>

Parameter	Extraction items
	<p>The authors demonstrate awareness of heterogeneity by choosing fixed effects when I^2 indicated low heterogeneity and random effects models for other analyses.</p> <p>The authors didn't discuss any weighting adjustment to account for combining data from a cRCT and RCT for gingivitis outcome or plaque index.</p> <p>For prospective cohort studies: N/A</p>

Outcomes assessed

List of authors' primary outcomes:

- Primary outcome 1 - Dental plaque index
- Primary outcome 2 - Oral hygiene status (OHI-S)
- Primary outcome 3 - Debris status (Simplified Debris Index)
- Primary outcome 4 - Gingival index (GI-S)
- Primary outcome 5 - Decayed, missing, filled teeth (DMFT)/decayed missing filled surface (DMFS) index

List of authors' secondary outcomes: N/A

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I^2 (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
	Plaque Index	Oral health education (OHE) vs controls	Silness and Löe Plaque Index	4 studies - 5 comparisons (Bardaweel, 2018; Chandrashekar, 2012; Chandrashekar 2014; Sadana 2017 (1);	MD 0.05 (95% CI - 0.17, 0.27)	p<0.67	94%	n=290 (experimental) n=290 (control)(possible double counting in group) In these comparisons random-effects model analysis, the mean cumulative difference	

Parameter	Extraction items								
				Sadana, 2017 (2))				showed no significant finding in the change of the Plaque Index favoring neither the intervention groups nor the control groups [0.05 (-0.17, 0.27)]	
	Oral hygiene index	Oral health education (OHE) vs controls	Simplified Oral Hygiene Index (OHI-S Index)	2 studies Chandrashekar, 2012; Chandrashekar, 2014	MD -0.37 (95% CI - 0.74, 0.00)	p<0.05	0%	n=80 (experimental) n=80 (control) Two studies in which there were OHE intervention groups vs control groups analyzing oral hygiene status outcome (OHI-S). On deducing the forest plot we found that the cumulative mean difference was -0.37 (- 0.74, 0.00) with fixed effect model based on the heterogeneity value of I2 indicating the newer methods (audio-visual aids) of OHE was more effective over traditional oral health interventions when improving oral hygiene status (Fig. 6).	

Parameter	Extraction items								
	Debris status index	Oral health education (OHE) vs controls	Simplified Debris Index (Debris-S index)	2 studies John, 2013; Kumar, 2015	MD -0.20 (95% CI - 0.33, - 0.07)	p<0.002	0%	n=55 (experimental) n=55 (control) In the fixed-effects model analysis, two studies were Simplified Debris Index was analyzed, showed a significant difference oral hygiene status between the two groups, with reduced mean debris score showed that interventions (drama/plays and games based OHE) being more effective group than the controls with cumulative mean difference as -0.20 (- 0.33, -0.07) (Fig. 7). The study conducted by Umamaheswari et al.14 used ordinal scale for outcome of interest so was not included in the meta-analysis.	Reports random-effects model in the text but forest plot reports fixed-effects model
	Gingival index	Oral health education (OHE) vs controls	Gingival index (Silness and Loe)	2 studies Bardaweel, 2018;	MD -0.00 (95% CI - 0.54, 0.54)	p=1	94%	n=150 (experimental) n=150 (control) Two studies in which gingivitis outcome	

Parameter	Extraction items								
				Chandrashekar, 2014				(Silness and L�e) were analyzed using random-effects model, showed a significant difference in improving and reducing gingivitis between the groups with mean difference of -0.00 (-0.54, 0.54), thus favoring neither the interventional nor the control group (Fig. 8).	
	Decayed, missing, filled, permanent teeth (DMFT) Index	Oral health education (OHE) vs controls	DMFT Index	Angelopoulos, 2015; Chandrashekar, 2014	MD -0.17 (95% CI - 0.73, 0.38)	p=0.54	84%	n=124 (experimental) n=140 (control) The DMFT/DMFS Index was assessed by two studies using random-effects model, showed a significant difference in the change in dental caries between the groups with mean difference of -0.17 (-0.73, 0.38). In the study by Chandrashekar et al., ¹ DMFS Index by Klein et al. was measured but it was found that there was	

Parameter	Extraction items								
								<p>also no significant difference between baseline ($p = 0.65$) and postintervention ($p = 0.56$) DMFS scores in the intervention and control group. Similarly, in the study conducted by Angelopoulou et al.⁶ the intervention was experimental learning through poster, charts, etc. and mean dental caries (DMFT) score was measured according to the diagnostic criteria of the British Association of Community Dentistry, which did not show a significant difference ($p = 0.601$) in both the groups at the end of 18 months (Fig. 9).</p>	

Footnotes

- (1) Sadana, 2017 – Verbal communication, but along with self-educational pamphlets group vs control group
- (2) Sadana, 2017 – Oral health education through verbal communication along with audiovisual method group vs control group

NARRATIVE SYNTHESIS

Parameter	Extraction items
	Not reported Separate summaries reported for RCTs and non-randomised studies when included in the same review? N/A
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>The authors provide minimal commentary on the impact of heterogeneity. They mention heterogeneity only briefly:</p> <p>For OHI-S analysis, they state: "with fixed effect model based on the heterogeneity value of I² indicating the newer methods (audio-visual aids) of OHE was more effective over traditional oral health interventions when improving oral hygiene status" - This suggests they acknowledged heterogeneity influenced their choice of statistical model but don't discuss its impact on results quality.</p> <p>They do not explicitly discuss how heterogeneity might affect the confidence in their findings or the quality of evidence.</p> <p>Causes of heterogeneity investigated? No</p> <p>The authors did not investigate causes of heterogeneity through formal methods. They mention "conducting subgroup analyses for all the selected outcomes as a variety of indices were used for recording" in the discussion, but this appears to refer to grouping studies by outcome measure rather than investigating heterogeneity sources.</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis)- NA • If yes, provide a brief indication of the extent of heterogeneity in the relevant results: NA
Comments	

He *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	He <i>et al.</i> (2024)
Review title	Effectiveness of psychological intervention in improving adolescents' oral health: A systematic review and meta-analysis
Review coding	Behavioural interventions; Adolescents; Mixed providers
Contributing primary studies	The information presented in this extraction form applies to 13/14 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.

Parameter	Extraction items																
<p>Objectives</p>	<p>Review research question(s) and/or objectives (including page number(s)): The main research question was “Are interventions based on psychological theories or models better than conventional oral health education or negative control in improving oral health among adolescents?”</p> <p>The aim was to evaluate the effectiveness of psychological interventions in improving oral health behaviors and status among adolescents.</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Adolescents 12-18 years old at baseline without systemic disease • Intervention: Psychological interventions based on theoretical models aimed at improving adolescents’ oral health. • Comparison: Conventional (prevailing) oral health education or negative control • Outcome: Primary outcome was oral health status (e.g. oral hygiene, periodontal health status, and dental caries). • Setting: In school settings or clinic settings and no restriction of countries or areas. • Study design: RCTs • Timeframe for follow-up: Not specified 																
<p>Participants</p>	<p>Number of participants: Individual studies ranged from 139 to 1159 participants. Total 5540 based on participant numbers reported for each of the 13 included studies</p> <p>Age (mean/mode/range): Participants were aged from 12 to 18 years</p> <p>Gender: Gender distribution of the participants in most of the studies was even, and in two studies the participants were exclusively females.</p> <p>Details of any additional relevant participant characteristics:</p>																
<p>Description of Interventions/ phenomena of interest</p>	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest								
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest										

Parameter	Extraction items							
	Dimen̄as 2022, 2024 Sweden Clinic-based	Prospective, multi- centred, two arm, quasi randomized field study.	N=312 16-17 year olds n=158 intervention; n=154 control	Dental hygienist	Cognitive behavioural person-centred oral health education programme: 3 treatment sessions, 45–60 min each, for a period of 10–12 weeks.	Conventional information and instruction	6 month follow- up	<ul style="list-style-type: none"> • Plaque index • Marginal bleeding index
	Aleksejū nienė 2022 Lithuania School-based	cRCT	N=196 15-16 year olds n=97 intervention; n=99 control	Dental professional	Individualized education for each adolescent based on his/ her needs for professional dental instruction.	One time preventive instruction, similar to what was commonly received in dental offices	6-month & 12- month follow- up	<ul style="list-style-type: none"> • Presence of disclosed plaque
	Xiang 2022 Hong Kong School-based	cRCT	N=1159 13 year olds n=587 intervention; n=572 control	Peer leaders	Multiple HBM/SCT-based peer-led oral health education sessions over 6 months, focused on peer participation and social interaction.	Booklets on oral health	6-month & 12- month follow- up	<ul style="list-style-type: none"> • DMFT and VPI
	Wu 2017, 2022 Hong Kong	RCT	N=512 12-13 year olds	Dental professional	Group 1: one-on- one face-to-face MI single session,	Oral health talk delivered to all participants of	6-month, 12- month &	<ul style="list-style-type: none"> • Caries increment • Plaque score

Parameter	Extraction items							
	School-based		n=163 group 1 intervention; n=188 group 2 intervention; n=161 control		which lasted 15–30 min. Group 2: patient communication tool, Cariogram, used at appropriate stages of the one-on-one face to-face MI session.	each school, lasted 30 minutes, including a 10-minute session for questions. Each participant received an education package	24-month follow-up	
	Movaseghi Ardekani 2022 Iran School-based	RCT	N=162 14-15 year old girls n=77 intervention; n=85 control	Researcher	Theory informed 4 weekly x 1-hour educational sessions on knowledge, behavior, and oral health literacy	No intervention	1-month follow-up	• Dental plaque index
	Scheerman 2020 Iran School-based	cRCT	N=791 12-17 year olds n=253 group 1 intervention; n=260 group 2 intervention; n=278 control	Dental professional and health scientist and a health psychologist created for social media platform	Content of the intervention based on the Health Action Process Approach (HAPA) delivered by the Telegram platform	No intervention	1-month & 6-month follow-up	• Visual PI • CPI

Parameter	Extraction items							
	Aleksejuniene and Brukienė 2018 Lithuania School-based	cRCT	N= 166 12-13 year olds n=48 group 1 intervention; n=52 group 2 intervention; n=66 control	Parental	Group 1: guided by the Precaution Adoption Process Model (PAPM) Group 2: guided by the Authoritative Parenting Model (APM).	Conventional dental instruction	3-month & 12-month follow-up	• Oral hygiene level
	Dzīvaugyte 2017 Lithuania School-based	cRCT	N=147 15-16 year olds n=73 intervention; n=74 control	Dental professional	5 individual sessions of self-efficacy theory-guided dental education for the improvement of oral self-care	One-time conventional dental instruction.	6-month & 12-month follow-up	• Oral self-care skills • Oral self-care practice
	Pakpour 2016 Iran School-based	cRCT	N=1109 mean age 15 years n=370 group 1 intervention; n=372 group 2 intervention; n=367 control	Unclear who, health science researcher	Leaflet containing information and recommendations on oral health and instructions on correct brushing behavior. Followed by instructions to form specific plans regarding brushing behavior.	Leaflet only	1-month & 6-month follow-up	• Dental plaque • Periodontal status

Parameter	Extraction items							
	Aleksejuniene 2016 Lithuania School-based	cRCT	N=139 15-16 year olds n=71 intervention; n=68 control	Dentist	3 Social-cognitive theory-guided face-to-face educational hands-on sessions	No intervention	6-month & 12-month follow-up	• Dental plaque level
	Gholami 2015 Iran School-based	cRCT	N=166 11-15 year old girls n=69 intervention; n=97 control	Unclear	A brief self-regulatory intervention on oral hygiene.	No intervention	4-week follow-up	Not Included: No outcomes of interest
	Pakpour 2014 Iran School-based	cRCT	N=372 mean age 15 years n=124 group 1 intervention; n=126 group 2 intervention; n=122 control	Unclear who, health science researcher	2 message framing pamphlets on oral self-care behaviors: gain-framed, and loss-framed.	No intervention	2-week & 24-week follow-up	• Dental plaque • Periodontal status
	Brukienė and Aleksejuniene 2012 Lithuania School-based	cRCT	N=221 12-13 year olds n=72 intervention; n=74 group 1 control; n=75 group 2 control	Parents	Authoritative parenting model (APM)-based interventions included letters and telephone calls, and newsletters to parents	Control group 1: Conventional dental education and behavior modification Control group 2: Conventional behavior modification	3-month & 12month follow-up	• Plaque level

Parameter	Extraction items							
	Aleksejū nieņe and Brukieņe 2012 Lithuania School-based	Stratified RCT	N=254 12-13 year olds n=89 intervention; n=84 group 1 control; n=81 group 2 control	Unclear who, health science researcher	Precaution Adoption Process Model (PAPM)-based intervention to change adolescent oral hygiene behaviour	Control group 1: conventional instruction Control group 2: no intervention	3-month & 12month follow-up	• Plaque level

Setting/context

Countries (no. studies) (in alphabetic order): Hong Kong (n = 2), Iran (n = 4), Lithuanian (n = 6), Sweden (n = 1),

Setting (no. studies): e.g. clinic-based (1 study), school-based (12 studies)

Other relevant features:

Protocol prepared: Yes

- **If published, number and link:** (registration number: CRD42023489508)
<https://www.crd.york.ac.uk/PROSPERO/view/CRD42023489508>

Number and names of databases: 6 databases

PubMed, Ovid Medline, Ovid Embase, Cochrane Library, APA PsycINFO (ProQuest) and Web of Science.

Other non-database sources:

Databases and sources searched

Details of any other supplementary searches:

- **Grey literature search:** No
- **Reference chasing:** Yes
- **Expert consultation:** No

Search strategy/key words provided: Yes, detailed search strategy provided in appendix

Time period covered by searches: January 1990 – June 2023 (updated in June 2024)

Search limits (e.g. date, language): written in English

- **Are search limits justified/appropriate?** No

Screening completed in duplicate: Yes

Parameter	Extraction items
	<ul style="list-style-type: none"> • If yes, rate of agreement: For cases of disagreements between the two reviewers, they were resolved through discussion. If necessary, a third reviewer was consulted to reach a consensus. <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: This study was supported by a grant from the Health and Medical Research Fund, Hong Kong (ref no. 19201281).</p> <p>Conflicts of interest declared: No potential conflicts of interest concerning the authorship and/or publication of this article are disclosed by the authors.</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: the publication years spanned from 2012 to 2024</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2012 (2 studies), 2014 (1 study), 2016 (2 studies), 2017 (2 studies), 2018 (1 study), 2020 (1 study), 2022 (5 studies), 2024 (1 study)</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 13 (16 papers)</p> <p>Number of studies by study design: RCT (3 studies), cRCT (9 studies), quasi-randomised field study (1 study)</p> <p>Funding of primary studies: No</p> <p>Conflicts of interest of primary studies: No</p> <p>Planned study design(s) to be included: RCTs</p> <p>Reasons for including study design(s) provided? Not specified or discussed</p>
Types of studies included	<ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane Risk of Bias Tool 2.0 (RoB 2)</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes

Parameter	Extraction items
Appraisal ratings	<ul style="list-style-type: none"> • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> Not applicable</p> <p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>High risk of bias (low quality) (k=4), unclear/moderate risk of bias (unclear/some concerns) (k=9), low risk of bias (high quality) (k=0)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <p>Most studies did not clearly state whether allocation concealment during the randomization process was maintained until participants were enrolled and underwent the intervention. Additionally, some studies failed to state whether baseline characteristics were comparable between the intervention and control groups. Moreover, for the outcome measurement, some of the studies did not mention whether the outcome assessors were aware of the interventions received by participants. In some studies, the assessment of outcomes may have been influenced by the knowledge of the intervention.</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No clear discussion <p>Assessment of publication bias: Not reported</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
	Method of analysis

Parameter	Extraction items																		
Outcomes assessed	<p>a meta-analysis, the RCTs addressing the same outcomes with sufficient data were used to calculate the overall effect size (standardized mean difference (SMD) and 95 % confidence interval (CI)) to compare the outcomes on oral health (page 5)</p> <p>Due to insufficient number of studies or inconsistencies in measurement standards, quantitative analysis could not be conducted for other outcome data.</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: If a study comprised multiple interventions or control groups, the control and intervention groups were merged to conduct a single pair-wise comparison, following the guidelines outlined in the Cochrane Handbook. • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. The effect of each study was weighted based on the adjusted effective sample size. • For prospective cohort studies: Not applicable • Statistical combination of data adjusted for confounding (not raw data): Yes/No • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): • Summary effect estimates reported separately for RCTs and prospective cohort studies: Not applicable <p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Oral hygiene - measured by Visual Plaque Index (VPI), % Oral Cleanliness Scores, Silness-L'oe Plaque Index, and Individual Quantitative Plaque% Index (IQPI) • Primary outcome 2: Periodontal status - measured by Community Periodontal Index (CPI) • Primary outcome 3: Dental caries <p>List of authors' secondary outcomes: Not applicable</p>																		
	<p>META-ANALYSIS FINDINGS</p> <p>Primary outcomes: Oral hygiene</p>																		
Results/findings	<table border="1"> <thead> <tr> <th>Outcome</th> <th>Intervention vs. comparator</th> <th>Measure</th> <th>Primary studies contributing to analysis</th> <th>Summary estimate</th> <th>p-value</th> <th>I² (%)</th> <th>Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)</th> <th>Additional information</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information									
Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information											

Parameter	Extraction items								
Oral hygiene in the short term (up to 6 months)	psychological intervention vs control	Various Plaque index	11 studies Aleksejūnienė 2016 & 2022; Aleksejūnienė, and Brukienė 2012 & 2018; Dimenās 2022; Džiaugytė 2017; Movaseghi Ardekani 2022; Pakpour 2014, 2016; Scheerman 2020; Wu 2017	SMD -0.97 [-1.45, -0.49]	<0.00001	98%	Pooled analysis from 11 RCTs (n=4187) reported low level evidence that psychological interventions could improve adolescents' oral hygiene measured on various plaque indices with the overall weighted SMD = -0.97 (95 % CI: -1.45, -0.49) at 6 months High heterogeneity reported	Low GRADE	
Oral hygiene in the longer term (12 – 24 months)	psychological intervention vs control	Various Plaque index	8 studies Aleksejūnienė 2016 & 2022; Aleksejūnienė, and Brukienė 2012 & 2018; Džiaugytė 2017; Wu 2017, 2022; Xiang 2022	SMD -0.31 [-0.64, 0.02]	0.07	94%	Pooled analysis from 8 RCTs (n=2993) reported no significant difference between psychological interventions and control with the overall weighted SMD = -0.31 (95 % CI: -0.64, 0.02) at 12 – 24 months High heterogeneity reported	Very low GRADE	

Primary outcomes: Periodontal status

Parameter	Extraction items							
Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Periodontal status in the short term (up to 6 months)	psychological intervention vs control	CPI scores	3 studies Pakpour 2014, 2016; Scheerman 2020	SMD -1.18 [-2.32, -0.04]	0.04	99%	Pooled analysis from 3 RCTs (n=2321) reported a better periodontal status of the participants in the intervention group at the 6 month follow-up, and with the overall weighted SMD = -1.18 (95 % CI: -2.32, -0.04). High heterogeneity reported	Very low GRADE

NARRATIVE SYNTHESIS

Primary outcomes: Dental caries

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Dental caries	psychological intervention vs control	Caries increment; DMFT	Wu 2017; Xiang 2022	Reported not estimable		Pooled analysis from 2 RCTs (n=1671) reported the increment of cavitated lesions was lower in the intervention group compared with the control group at 12 months. Only 1 study found the same result at 24 months	Very low GRADE

Secondary outcomes Not applicable

Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable

Parameter	Extraction items
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence: Authors report that the included studies in the review had high heterogeneity in study design, implementation of intervention, follow-up duration and outcome measurements which lowers the certainty of the evidence, the generalizability of the results, and the interpretation of the clinical effects. Authors report that the quality and certainty of the evidence was low to very low. Most of the included studies only used a single psychological theory model as the intervention and the model used varied from study to study.</p> <p>Causes of heterogeneity investigated? No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	The systematic review found low to moderate evidence showing that psychological interventions are effective in improving adolescents' oral hygiene and periodontal status when compared with traditional oral health education or negative control.

Karande *et al.* (2023) – Extraction form

Parameter	Extraction items
First author and year of publication	Karande <i>et al.</i> (2023)
Review title	Comparative evaluation of oral health and behavior changes in children after motivational interviewing and traditional method of oral health education among mothers: a systematic review and meta-analysis
Review coding	Mothers and children; Mixed providers (dental health professionals or caregiver); Motivational Interviewing (MI)
Contributing primary studies	The information presented in this extraction form applies to the 7/9 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (i.e. < Primary outcomes (as defined by systematic review authors) >)
Objectives	<p>Review research question(s) and/or objectives (including page number(s)):</p> <p>Is there a difference in the effect of MI and the traditional method of oral health education given to mothers on oral health outcomes and behavior changes of their children? (page 466)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Mothers and their children (irrespective of age of either) • Intervention: Motivational interviewing (MI) delivered by a dental health care professional or caregiver

Parameter	Extraction items																														
Participants	<ul style="list-style-type: none"> • Comparison: Traditional oral health education • Outcome: oral health of children – dental caries, dental plaque score, gingival score • Setting: not specified • Study design: randomized controlled trials, non-randomized controlled trials, quasi-experiments, and clinical trials. • Timeframe for follow-up: minimum of 2 months follow-up 																														
	<p>Number of participants: 2786 totalled based on participant numbers reported for each of the 7 included studies</p> <p>Age (mean/mode/range): no age specified</p> <p>Gender: no gender of children specified</p> <p>Details of any additional relevant participant characteristics:</p> <p>Authors defined MI as oral health education, through the specific goal of the importance of child’s oral health and toothbrushing, and openly discussing concerns and obstacles in changing behaviour and giving reinforcements at particular time intervals through posters, pamphlets, audiovisual aids, telephone, e-mails, letters.</p> <p>Authors defined traditional oral health education as oral health instruction using posters, pamphlets, or any other aids without any reinforcement</p>																														
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p>																														
	<p>Overview of relevant characteristics of primary studies included in systematic review: all interventions provided by dental health professional or caregiver, not specified by study</p>																														
<table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Mohammadi (2015) Iran</td> <td>Community RCT Children 4–6-year-olds</td> <td>N=222 n=111/108 MI n=111/105 TE</td> <td></td> <td>7 x 45-minute MI sessions</td> <td>1 45-minute TE sessions</td> <td>Follow-up at 6 months</td> <td>Mean ± SD of ICDAS score, PI, GI (frequency %)</td> </tr> <tr> <td>Gonzalez (2014) Mexico</td> <td>RCT</td> <td>N=100 n=50/49 MI n=50/47 TE</td> <td></td> <td>7 x 45-minute MI sessions</td> <td>1 45-minute TE sessions</td> <td>Follow-up at 6 and 12 months</td> <td>Mean, SD of ICDAS score, PI (mean SD),</td> </tr> </tbody> </table>								Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest	Mohammadi (2015) Iran	Community RCT Children 4–6-year-olds	N=222 n=111/108 MI n=111/105 TE		7 x 45-minute MI sessions	1 45-minute TE sessions	Follow-up at 6 months	Mean ± SD of ICDAS score, PI, GI (frequency %)	Gonzalez (2014) Mexico	RCT	N=100 n=50/49 MI n=50/47 TE		7 x 45-minute MI sessions	1 45-minute TE sessions	Follow-up at 6 and 12 months	Mean, SD of ICDAS score, PI (mean SD),
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Parameter	Extraction items							
		Children 6-10-year-olds						questionnaire for in-between snacking (mean)
	Nomaire (2020) Egypt Excluded as only secondary outcomes	RCT Children 4–6-year-olds	N=116 n=58/52 MI n=58/55 TE		4 x 15–30-minute MI sessions	1 15-minute TE sessions	Follow-up at 6 months	The mean and standard deviation of the questionnaire score
	Weinstein (2006) US	RCT Children 6–18-month-olds	N=440 n=220/205 MI n=220/200 TE		7 x 45-minute MI sessions	1 11-minute TE session	Follow-up at 2 years	New caries in % using (modified Radike criteria)
	Manchanda (2014) India	RCT Children 6–18-month-olds	N=320 n=160/137 MI n=160/128 TE		5 MI sessions, duration not reported	1 TE session, duration not reported	Follow-up at 8 months	Mean, SD (WHO + Initial lesions), mean ± SD score of questionnaire used for in-between snacking and frequency of toothbrushing
	Colvara (2018) Brazil	Community RCT Children born in the year 2013	N=469 n=245/175 MI n=224/145 TE		1 x 20–40 minute MI session	1 x 20–40 minute TE session	Follow-up at 3 years	Mean (95% CI) of score ICDAS

Parameter	Extraction items							
	Naidu (2015) Trinidad Excluded as only secondary outcome	Cluster RCT Children 5–6-year-olds	N=79 n=25/21 MI n=54/20 TE		4 x 30 minute sessions MI	1 x 30 minute sessions TE	Follow-up at 4 months	Mean and SD of the questionnaire used for in-between snacking and frequency of toothbrushing
	Ismail (2011) US	Community RCT Children 0–5 year-olds	N=1021 n=506/299 MI n=515/300 TE		3 x 40 minute sessions MI	1 x 40 minute session TE	Follow-up at 6 months and 2 years	ICDAS (IRR), questionnaire (OR)
	Saengtibovorn (2017) Thailand	RCT Children 6 months–5 year-olds	N=214 n=107/98 MI n=107/98 TE		3 x 15 minute sessions MI	1 x 10 minute TE session	Follow-up at 3 and 6 months	The mean difference between a cavitated and noncavitated, mean difference of plaque score

MI (Motivational interviewing); TE (traditional education); DMFT (decayed, missed, filled permanent tooth); DMFS/dmfs (decayed, missed, filled tooth surface); PI (plaque index); GI (gingival index); ICDAS (International Caries detection and Assessment System)

Setting/context

Countries (no. studies) (in alphabetic order): Brazil (1 study), India (1 study), Iran (1 study), Mexico (1 study), Thailand (1 study), United States (2 studies)

Setting (no. studies): No information on setting provided

Other relevant features:

Databases and sources searched

Protocol prepared: Yes

- **If published, number and link:** Available from <https://www.crd.york.ac.uk/PROSPERO/view/CRD42021224278>

Parameter	Extraction items
	<p>Number and names of databases: 4 databases were searched – Pubmed, Medline, Directory of Open Access journals (DOAJ), Cochrane Library</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes. Google scholar • Reference chasing: Yes, articles were screened by cross reference and citation chasing, along with hand searching from speciality paediatric journals. • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: search included studies published between 1st January 2000 and 31st December 2020</p> <p>Search limits (e.g. date, language): limited to English language</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? No information provided <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: The level of concordance, calculated through Cohen’s kappa, between the two reviewers was 0.94 for titles and abstracts and 0.96 for full texts. (page 466) <p>Extraction completed in duplicate: Yes.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: A pilot form with data extraction was conducted of two articles. After the consensus of both authors with the data extracted, further extraction was commenced <p>Funding of review: No information on funding provided</p> <p>Conflicts of interest declared: No information provided</p> <p>If declared, how conflicts of interest were managed:</p>
<p>Date Range (years) of included studies</p>	<p>Date range for included studies relevant to this overview of reviews: Included studies range from 2006 to 2018</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2006 (1 study), 2011 (1 study), 2014 (2 studies), 2015 (1 study), 2017 (1 study), 2018 (1 study)</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 7/9 studies</p> <p>Number of studies by study design: 7 RCTs,</p> <p>Funding of primary studies: No information provided</p> <p>Conflicts of interest of primary studies: No information provided</p>

Parameter	Extraction items
Types of studies included	<p>Planned study design(s) to be included: Controlled clinical trials, clinical trials, randomized controlled trial</p> <p>Reasons for including study design(s) provided? No information provided</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes. Authors reported that 201 articles were excluded with reason; absence of appropriate control group in 82, outcomes measured with inappropriate index in 34, intervention conducted by other personnel in 26, and intervention group other than MI in 59 articles.</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane ROB assessment tool</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: Not applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>Review authors reported the Risk of bias (ROB) as assessed by the Cochrane ROB tool applied to the included studies revealed that one study was of low risk (Saengtipbovorn 2017), one study of moderate risk (Manchanda), while five studies (Gonzalez, Weinstein, Mohammadi, Colvara, and Ismail) were of high risk.</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): Authors reported, the quality of the studies included in the review ranged from low to high risk resulted in significantly favouring MI; Authors reported from "the studies assessing pooled data on dental caries between the two interventions, both the studies used the ICDAS standard for assessment but one of the studies was of high risk" (Gonzalez 2014, Colvara 2018). However according to the ROB reported on page 470, both studies were high risk of bias</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No

Parameter	Extraction items
	<ul style="list-style-type: none"> • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Review authors reported that the results obtained were irrespective of the risk involved in the studies. (page 471) Authors reported they did not conduct sensitivity analysis that would provide pooled evidence of studies excluding the high ROB while including only low and moderate ROB studies.(page 472) <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number): Authors reported nine studies, seven of which were included in the present review and were subjected to qualitative synthesis, from these two were considered for quantitative synthesis of primary outcomes (dental caries). (page 466)</p> <p>Measures of continuous data were assessed as change in mean score before and after intervention for dental caries, plaque index score, and gingival index score. Mean differences and their standard deviation were analyzed using Review Manager 5.3 software. Chi-square and Tau-square were used to assess whether the observed difference was homogeneous or heterogeneous among the studies. The heterogeneity between the studies was assessed using I^2 statistics. A random-effects model for meta-analysis was performed if the heterogeneity was found to be high. Also, the statistical significance was set at p-value (two-tailed) <0.05.</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: no information provided • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? No information provided. <p>For prospective cohort studies: not applicable</p> <ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): Yes/No • Authors' justification for combination of raw data where adjusted estimates were not available (include page number): • Summary effect estimates reported separately for RCTs and prospective cohort studies: Not applicable

Parameter	Extraction items
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Outcomes assessed

List of authors' primary outcomes:

- Primary outcome 1: dental caries
- Primary outcome 2: children's oral health (dental caries, dental plaque, gingival score)

List of authors' secondary outcomes: not applicable

META-ANALYSIS FINDINGS

Primary outcomes: dental caries

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Dental caries	Oral health education using Motivational interviewing vs Traditional education methods	ICDAS (International Caries detection and Assessment System) using a fixed effect model	2 studies (Gonzalez 2018; Colvara 2018) N=416	MD -1.03 [-1.37, -0.70]	0.00001	0%	The meta-analysis pooled effects from 224 participants in the MI group and 192 in the traditional health education group. A significant difference was observed in dental caries favoring the MI group with a mean difference of -1.03(95% CI--1.37-0.70) (p < 0.05) The incidence of Dental caries was less in children whose mothers received MI as compared to traditional health education.	

Parameter	Extraction items
	<p>Secondary outcomes not applicable</p> <p>NARRATIVE SYNTHESIS</p> <p>Primary outcomes: Children’s oral health - dental caries, dental plaque, gingival score</p> <p>All the studies supported MI in improving children’s oral health significantly, except for one study (Ismail 2011) that failed to reduce the number of new untreated carious lesions in children.</p> <p>Overall, results significantly favoring MI, were reported in three of the studies included in the current review (Mohammadi 2015, Manchanda 2014, Colvara 2018) while in one study (Gonzalez 2014) reported that MI is an effective and promising technique for establishing preventive behaviors, another study (Weinstein 2006) reported that MI enhanced the preventive behavior of mothers of young children at high risk of developing caries, yet another study (Saengtipbovorn 2017) demonstrated that combination of MI and caries risk assessment in one program, decreased early childhood caries in preschool children. The review reported only one study (Ismail 2011) that did not favour MI and signified that a single MI intervention might change some reported oral health behaviors, but it failed to reduce the number of new untreated carious lesions among children.</p> <p>Secondary outcomes: Not applicable</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable</p> <p>Authors’ comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Authors noted there was a great variation in the number and duration of sessions for MI and TE across the included studies, a minimum of one MI session to a maximum of seven sessions. Only one study had equal sessions numbers.</p> <p>Heterogeneity</p> <p>Causes of heterogeneity investigated? No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	<p>Review authors note that all the studies reported a loss of follow-up. The authors assert that results of the present review are comparable with the reviews conducted in the past. They note that all the educational approaches provided in MI are initiated only after recognizing that the patient is willing to hear and adapt to the change.</p>

Kim and Kim (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	Kim and Kim (2024)
Review title	Effectiveness of School-Based Oral Health Education for Children and Adolescents in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis
Review coding	Providers: Some unclear providers Participants: Children and adolescents; School-based; Low- and middle-income countries;
Contributing primary studies	The information presented in this extraction form applies to 20/20 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “This study aimed to review and assess the effectiveness of school-based oral health education programs in low-income and middle-income countries.” p313</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: For the participants, studies that targeted school-age children and adolescents were included. • Intervention: Lectures, practical demonstrations, and hands-on sessions were considered interventions in oral health education. • Comparison: For the statistical sampling selection, we preferred the studies that designed experimental and control groups, that is, participants of oral health education as the experimental group and those who did not receive any education or received only one-shot education as a control group. • Outcome: Studies that measured the awareness level, behavior change, and oral health status as outcome variables were included. • Setting: School-based • Study design: Selected research materials were limited to randomized control trials or quasi-experimental studies (nonrandomized control trials) providing full text in English. • Timeframe for follow-up: Not reported
Participants	<p>Number of participants: Not reported 11,096 participants totalled from included studies</p> <p>Age (mean/mode/range): Not reported</p> <p>Gender: Not reported</p> <p>Details of any additional relevant participant characteristics: Not reported</p> <p>By target population, 14 studies included children and adolescents as the primary target population, and six studies had parents and teachers as stakeholders to promote the prolonged effects of the intervention.</p>

Parameter	Extraction items							
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p>							
	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration (f/u)	Outcomes
	Thomas (2000) India	NRS	1. 103 2. 138 3. 100 Control: 89 Total: 430	Not reported	1. Instruction and demonstration 2. Instruction to children and teachers 3. Instruction to children and parents	Control	3 months (0, 1 month, 2 months, 3 months)	Plaque Index (PI), Gingival Index (GI)
	Frencken (2001) Zimbabwe	RCT	Intervention: 477 Control: 488 Total: 965	Teacher	Instruction	Control	3.5 years (0, 1 year, 2 years, 3.5 years)	Quigley-Hein Plaque Index (QHI), caries increment
	Mayer (2003) Brazil	RCT	1. 39 2. 23 Control: 41 Total: 103	Not reported	1. Instruction to children, parents, teachers and TBI 2. Instruction and TBI	Control	3 years (3 years, 8 years)	Knowledge and behavior
Rodrigues (2003) Brazil	NRS	1. 20 2. 20 3. 20	Not reported	1. Indirect instruction using a robot	Control	1 day (0, 1 month)	O'Leary index	

Parameter	Extraction items							
			Control: 20 Total: 80		2. Indirect instruction using slides and audio-visual aids 3. Instruction using models			(Plaque Index)
	Peng (2004) China	RCT	1. 363 2. 410 Control: 370 Total: 1143	Teacher	1. Instruction, supervised toothbrushing and sugar-free gum 2. Instruction and supervised toothbrushing	Control	2 years (0, 2 years)	Bleeding presence, Decayed, Missing, Filled Teeth (DMFT), Decayed, Missing, and Filled Surfaces (DMFS)
	Petersen (2004) China	RCT	Intervention: 335 Control: 331 Total: 666	Teacher	Instruction and supervised toothbrushing	Control	3 years (0, 3 years)	Behavior, Decayed, Missing, Filled Teeth (DMFT), Decayed, Missing, and Filled Surfaces (DMFS)
	de Farias (2009) Brazil	RCT	Intervention: 132	Dentist	Instruction and demonstration	Control	4 months (0, 5 months)	Knowledge, Visual Plaque

Parameter	Extraction items							
			Control: 115 Total: 247					Index (PI), bleeding, Decayed, Missing, and Filled Surfaces (DMFS)
	Saied-Moallemi (2009) Iran	RCT	1. 110 2. 112 3. 109 Control: 116 Total: 447	Health professional	1. Instruction and demonstration 2. Leaflet to parents 3. Instruction, leaflet to parents	Control	3 months (0, 3 months)	Modified Plaque Index (PI), Gingival Index (GI)
	Tai (2009) China	RCT	Intervention: 661 Control: 697 Total: 1358	Teacher	Instruction to children; instruction to mothers; booklet, posters, contests; dental hospital tour; oral examination; fluoride toothpaste; preventive and curative care	Control	3 years (0, 3 years)	Knowledge and behavior, Community Periodontal Index (CPI), Gingival Index (GI), Decayed, Missing, Filled Teeth (DMFT), Decayed, Missing, and Filled

Parameter	Extraction items							
								Surfaces (DMFS)
	Yazdani (2009) Iran	RCT	1. 135 2. 130 Control: 123 Total: 388	Not reported	1. Indirect instruction using leaflet 2. Indirect instruction using videotape	Control	3 months (0, 3 months)	Modified Plaque Index (PI), Community Periodontal Index (CPI)
	Shenoy (2010) India	NRS	Intervention: 310 Control: 105 Total: 415	Not reported	Instruction using audio-visual aids	Control	6 months (0, 3 months, 6 months)	Knowledge, Plaque Index (PI), Gingival Index (GI)
	Haleem (2012) Pakistan	RCT	1. 303 2. 307 3. 325 Control: 290 Total: 1225	1. Dentist 2. Teacher 3. Peer	1, 2, 3. Instruction, TBI demonstration, and group activities	Control	6 months (0, 1 month, 7 months, 1.5 years, 2.5 years)	Knowledge and behavior, plaque, and gingival index
	Yekaninejad (2012) Iran	RCT	1. 123 2. 127 Control: 129 Total: 379	Health education specialist	1. Instruction to children 2. Instruction to children and booklet to parents and teachers	Control	3 months (0, 2 weeks, 3 months)	Behavior, Simplified Oral Hygiene Index (OHI-S), Community Periodontal Index (CPI)

Parameter	Extraction items							
	Mbawalla (2013) Tanzania	RCT	Intervention: 374 Control: 353 Total: 727	Researcher	Instruction and supervised toothbrushing	Control	2 years (0, 2 years)	Simplified Oral Hygiene Index (OHI-S), gingival bleeding index, decayed teeth
	Nammontri (2013) Thailand	RCT	Intervention: 132 Control: 125 Total: 257	Teacher	Instruction and discussion	Control	2 months (0, 2.5 months, 5 months)	Gingival health, and Decayed, Missing, Filled Teeth (DMFT)
	Chandrashekar (2014) India	RCT	1. 35 2. 36 3. 34 Control: 36 Total: 141	1. Dentist 2. Teacher 3. Teacher	1. Instruction using audio-visual aids 2. Instruction and oral screening 3. Instruction, oral screening and provision of toothbrush and toothpaste	Control	6 months (0, 6 months)	Simplified Oral Hygiene Index (OHI-S), Plaque Index (PI), Gingival Index (GI), Decayed, Missing, and Filled Surfaces (DMFS)

Parameter	Extraction items							
	Pakpour (2014) Iran	RCT	1. 124 2. 126 Control: 122 Total: 372	Teacher	1. Instruction using a gain-framed pamphlet 2. Instruction using a loss-framed pamphlet	Control	6 months (0, 2 weeks, 6 months)	Behavior, Quigley-Hein Plaque Index (QHI), Community Periodontal Index (CPI)
	Jaime (2015) Brazil	NRS	Intervention: 98 Control: 96 Total: 194	Dentist	Instruction using audio-visual aids	Control	1 year (0, 3 years)	Knowledge and behavior, Decayed, Missing, Filled Teeth (DMFT)
	Pakpour (2016) Iran	RCT	1. 370 2. 372 Control: 367 Total: 1109	Health professional	1. TBI, indirect instruction (general planning), provision of toothbrush 2. TBI, indirect instruction (implementation intention), provision of toothbrush	Control	6 months (0, 1 month, 6 months)	Behavior, Quigley-Hein Plaque Index (QHI), Community Periodontal Index (CPI)
	Vangipuram (2016) India	RCT	1. 150 2. 150	1. Dentist 2. Peer	1. Instruction using visual aids	Control	6 months (0, 3	Knowledge and behavior,

Parameter	Extraction items							
			Control: 150		2. Instruction using visual aids		months, 6 months)	Plaque Index (PI), Gingival Index (GI)
			Total: 450					

Countries (no. studies) (in alphabetic order):

Brazil (4 studies)

China (3 studies)

India (4 studies)

Iran (5 studies)

Pakistan (1 study)

Tanzania (1 study)

Thailand (1 study)

Zimbabwe (1 study)

Setting (no. studies):

Primary school (13 studies)

Secondary schools (5 studies)

High schools (2 studies)

Other relevant features: Providers

Various educators delivered oral health education: schoolteachers in six studies, dental or health professionals in five studies, peers and professionals in three studies, and researchers in one study, while one study provided indirect instruction only, and four studies did not provide clear information

School teachers (6 studies)

Dental or health professionals (5 studies)

Peers and professionals (3 studies)

Researchers (1 study)

Indirect instruction (1 study)

Unclear (4 studies)

Setting/context

Parameter	Extraction items
Databases and sources searched	<p>Protocol prepared: No</p> <ul style="list-style-type: none"> • If published, number and link: <p>Number and names of databases: 4 databases MEDLINE, EMBASE, Cochrane Library, and CINAHL.</p> <p>Other non-database sources: No</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: No • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: Not reported</p> <p>Search limits (e.g. date, language): Language must be in English</p> <p>Are search limits justified/appropriate? Not reported</p> <p>Screening completed in duplicate: Not reported – No information on selection procedures</p> <ul style="list-style-type: none"> • If yes, rate of agreement: <p>Extraction completed in duplicate: Not reported – No information on data extraction</p> <ul style="list-style-type: none"> • If yes, rate of agreement: <p>Funding of review: None The author(s) received no financial support for the research, authorship, and/or publication of this article.</p> <p>Conflicts of interest declared: None The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: 2000-2016</p> <p>Exact years of publication of studies relevant to this overview of reviews:</p> <p>2000 (1 study - Thomas (2000))</p> <p>2001 (1 study - Frencken (2001))</p>

Parameter	Extraction items
	<p>2003 (2 studies - Mayer (2003), Rodrigues (2003))</p> <p>2004 (2 studies - Peng (2004), Petersen (2004))</p> <p>2009 (4 studies - de Farias (2009), Saied-Moallemi (2009), Tai (2009), Yazdani (2009))</p> <p>2010 (1 study - Shenoy (2010))</p> <p>2012 (2 studies - Haleem (2012), Yekaninejad (2012))</p> <p>2013 (2 studies - Mbawalla (2013), Nammontri (2013))</p> <p>2014 (2 studies - Chandrashekar (2014), Pakpour (2014))</p> <p>2015 (1 study - Jaime (2015))</p> <p>2016 (2 studies - Pakpour (2016), Vangipuram (2016))</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 20 studies</p> <p>Number of studies by study design:</p> <ul style="list-style-type: none"> • 4 NRS: Thomas (2000), Rodrigues (2003), Shenoy (2010), Jaime (2015) • 16 RCT: Frencken (2001), Mayer (2003), Peng (2004), Petersen (2004), de Farias (2009), Saied-Moallemi (2009), Tai (2009), Yazdani (2009), Haleem (2012), Yekaninejad (2012), Mbawalla (2013), Nammontri (2013), Chandrashekar (2014), Pakpour (2014), Pakpour (2016), Vangipuram (2016) <p>Funding of primary studies: No</p> <p>Conflicts of interest of primary studies: No</p> <p>Planned study design(s) to be included: Selected research materials were limited to randomized control trials or quasi-experimental studies (nonrandomized control trials) providing full text in English.</p> <p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
<p>Types of studies included</p>	<p>Full name of tool(s) used:</p> <ul style="list-style-type: none"> • RCTs - Cochrane's "Risk of Bias (RoB)" tool • NRS - Cochrane's "Risk of Bias Assessment Tool for Non-randomized Study (RoBANS)" <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes
<p>Appraisal instruments used</p>	

Parameter	Extraction items
	<p>Within RoB 2's Domain 1 (Randomization process), the signaling questions include:</p> <p><u>Random sequence generation questions:</u></p> <ul style="list-style-type: none"> • Was the allocation sequence random? • Was the allocation sequence adequately concealed until participants were enrolled and assigned? <p><u>Allocation concealment questions:</u></p> <p>Did baseline differences between intervention groups suggest a problem with the randomization process?</p> <ul style="list-style-type: none"> • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> N/A</p> <ul style="list-style-type: none"> • Confounding: Yes/No • Selection bias: Yes/No • Exposure and outcomes: Yes/No • Selective reporting: Yes/No
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality): The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included studies have the following judgements:</p> <p>RCTs - Cochrane's "Risk of Bias (RoB)" tool</p> <ul style="list-style-type: none"> • High risk of bias (low quality): k=3 (Frencken (2001), Mbawalla (2013), Nammontri (2013)) • Unclear/moderate risk of bias (unclear/moderate quality): k=4 (Mayer (2003), Saied-Moallemi (2009), Tai (2009), Vangipuram (2016)) • Low risk of bias (high quality): k=9 (Chandrashekar (2014), de Farias (2009), Haleem (2012), Pakpour (2014), Pakpour (2016), Peng (2004), Petersen (2004), Yazdani (2009), Yekaninejad (2012)) <p>NRS - Cochrane's "Risk of Bias Assessment Tool for Non-randomized Study (RoBANS)"</p> <ul style="list-style-type: none"> • High risk of bias (low quality): k=1 (Rodrigues (2003)) • Unclear/moderate risk of bias (unclear/moderate quality): k=1 (Thomas (2000))

Parameter	Extraction items
	<ul style="list-style-type: none"> • Low risk of bias (high quality): k=2 (Jaime (2015), Shenoy (2010)) <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? <p>We followed three steps to assess publication bias. First, a funnel plot is presented to examine publication bias visually. It is a scattered plot of the effect size estimate against a measure of its precision, standard error, and sample size.²³ Second, the "trim and fill" method is used to identify the impact of publication bias and correct the funnel plot asymmetry. It attempts to trim the smaller studies causing funnel plot asymmetry, use the trimmed funnel plot to estimate the true center of the funnel and replace the omitted and missing studies.²⁴ Third, Rosenthal's Fail-and-Safe number estimates the number of unpublished studies in the given area and represents the number of studies required to refute significant meta-analytic results.²⁵ When the estimated number is larger than "$5 * k + 10$ (k = number of studies)," the estimated result is considered reliable.</p> <ul style="list-style-type: none"> • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): Not reported
Method of analysis	<p>Authors description of method of analysis (include page number):</p> <p>A total of six studies were included in the meta-analysis for quantitative synthesis. The overall effect was estimated for each outcome variable, including plaque index (PI), gingival index (GI), Decayed, missing, and filled permanent teeth or surfaces (DMFS), and gingival health. As PI, GI, and DMFS were continuous variables, the standardized mean difference was used to combine the effect sizes. The variable that estimated the level of gingival health was dichotomous; therefore, the OR was used to estimate the effect size. As the effect direction of PI, GI, and DMFS is negative, the lower the g value indicated, the higher the effect size. The table below indicates that school-based oral health education effectively changed the PI, GI, and gingival levels but not DMFS. A random effect model was used to interpret the effect sizes to compensate for the difference in study design, environment, target population, and intervention methods across the studies. p315</p> <p>Authors' justification for narrative synthesis or meta-analysis: Yes</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis:

Parameter	Extraction items
	<p>"Considering the lack of evidence on oral health education for children and adolescents, especially in low- and middle-income countries, this study focuses on analyzing characteristics of the oral health education program and computing effect sizes to determine the effectiveness of the intervention in low- and middle-income countries."</p> <ul style="list-style-type: none"> • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? <p>Yes, the authors used appropriate techniques:</p> <ol style="list-style-type: none"> 1. Random effects model: They explicitly state "We used Higgins I²-statistic method to test heterogeneity across studies and preferred a random effects model in interpreting the result as the interventions applied in the studies were not uniform." 2. Heterogeneity assessment: They calculated I² statistics for all outcomes: <ol style="list-style-type: none"> a. Plaque index: I² = 95.7% (high heterogeneity) b. Gingival index: I² = 92.8% (high heterogeneity) c. DMFS: I² = 0% (no heterogeneity) d. Gingival health: I² = 0% (no heterogeneity) <p>For prospective cohort studies: N/A</p>

Outcomes assessed

List of authors' primary outcomes:

- Primary outcome 1: Plaque Index
- Primary outcome 2: Gingival index
- Primary outcome 3: DMFS
- Primary outcome 4: Gingival health

List of authors' secondary outcomes: NA

Results/findings	META-ANALYSIS FINDINGS								
	Primary outcomes								
	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information

Parameter	Extraction items								
	Plaque Index	Oral health education vs Control	Silness and Loe PI	4 studies: 5 comparisons NRS – Thomas (2000); Shenoy (2010-1); Shenoy (2010-2) RCT – Chandrashekar (2014-2), Vangipuram (2016-1)	SMD -1.09 (95% CI - 1.81, - 0.38)	p<0.0001	95.7%	n=599 (experimental) n=380 (control) The overall effect of the Silness and Loe PI was measured in five studies—three non-randomized studies and two randomized controlled trials. The value of heterogeneity, 95 with a P value less than .001, implies high heterogeneity across the studies. However, the significant g value of [-1.09] supports the hypothesis that a large effect size is shown after delivering school-based oral health education programs at the plaque level. The forest plot visually supports the large effect size and the high heterogeneity across the studies. While subgroup analysis by study design rejects the effect size in the randomized controlled	These results refer to the random effects model. They also performed a fixed effect MA, but these results are not presented here.

Parameter	Extraction items								
								<p>trials, the computed effect size of the studies altogether shows a strong effect of oral health education in PI</p>	
	<p>Gingival index</p>	<p>Oral health education vs Control</p>	<p>Silness and Loe GI</p>	<p>4 studies: 5 comparisons NRS - Thomas (2000-2), Shenoy (2010-3), Shenoy (2010-4) RCT – Chandrashekar (2014-3), Vangipuram (2016-2)</p>	<p>SMD -0.85 (95% CI - 1.39, - 0.31)</p>	<p>p < .0001</p>	<p>92.8%</p>	<p>n=599 (experimental) n=380 (control) The Loe and Silness GI was calculated from the five studies and showed a significant effect from school based oral health education programs. The effect size was 0.85, corresponding to the large effect size. The value of heterogeneity, 93, with a P value less than .01, showed high heterogeneity across the studies. The forest plot supported a high effect size in measuring GI and heterogeneity across the studies. Subgroup analysis by study design rejected the effect represented</p>	<p>As above</p>

Parameter	Extraction items								
								in non-randomized studies, but studies altogether showed the presence of a significant effect size.	
	DMFS	Oral health education vs Control	DMFS	2 studies – Specifics not reported	SMD - 0.003 (95% CI - 0.19, 0.19)	p=0.91	0.0%	n= Not reported DMFS was also estimated, but the result showed that the intervention was not significant to change DMFS level in the case groups.	As above
	Gingival health	Oral health education vs Control	Not reported	3 studies - Nammontri (2013), Saied-Moallemi (2009), de Farias (2009)	OR 0.56 (95% CI 0.40, 0.77)	p=0.68	0.0%	n=343 (experimental) n=333 (control) Three studies estimated gingival health as a dichotomous variable. We selected these studies for effect computation due to the similarity of the intervention in delivering direct instruction to schoolchildren over a 2-month to 4-month period. The selected studies were all	As above

Parameter	Extraction items								
								<p>randomized controlled studies, and the collected data were computed to estimate effect size in OR. The overall effect indicated that gingival health increased significantly in the case groups after the intervention. Regarding the OR, 56% of the case group was likely to experience gingival disease compared with the control group. There was no concern of heterogeneity in interpreting the overall effect of gingival health as I2 was zero.</p>	

Secondary outcomes = NA

NARRATIVE SYNTHESIS = Not provided

Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

The authors acknowledge significant heterogeneity and its impact throughout the paper

Causes of heterogeneity investigated? Yes

- If yes, describe methods (e.g. subgroup/sensitivity analysis)

Subgroup analysis by study design:

Heterogeneity

Parameter	Extraction items
	<p>The authors state: "While subgroup analysis by study design rejects the effect size in the randomized controlled trials, the computed effect size of the studies altogether shows a strong effect of oral health education in PI"</p> <p>They performed similar subgroup analyses for both Plaque Index and Gingival Index, separating randomised vs non-randomised studies</p> <ul style="list-style-type: none"> If yes, provide a brief indication of the extent of heterogeneity in the relevant results: <p>From Table 2, the I² statistics show: Plaque index: I² = 95.7% (very high heterogeneity) Gingival index: I² = 92.8% (very high heterogeneity) DMFS: I² = 0.0% (no heterogeneity) Gingival health: I² = 0.0% (no heterogeneity)</p> <p>The authors note that despite high heterogeneity for some outcomes, they still found significant effects, though they appropriately caution about the limitations this creates for their meta-analysis conclusions.</p>
Comments	<p>There is so little detail on what participant numbers were used in the analysis and why they used only some arms of individual trials. For example in the PI analysis they included 5 studies but only one intervention group from Thomas yet split Shenoy intervention group in 2. For DMFS they include 2 studies with no information on which ones as 5 studies in their primary study summary appear to have measured this.</p>

Mehta *et al.* (2025) – Extraction form

Parameter	Extraction items
First author and year of publication	Mehta <i>et al.</i> (2025)
Review title	Effectiveness of Educating Caregivers on Oral Health of Institutionalized Older Adults: A Systematic Review and Meta-Analysis
Review coding	Providers: Some unclear providers Participants: Older adults
Contributing primary studies	The information presented in this extraction form applies only to 11/14 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.

Parameter	Extraction items
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “This systematic review and meta-analysis aims to evaluate the effectiveness of caregiver education and training programmes, offering evidence-based insights into how these interventions can enhance oral health outcomes and support the well-being of institutionalised older adults, focusing on outcomes such as denture hygiene, dental plaque levels and caregiver knowledge, attitudes and practices (KAP).” p3</p> <p>What is the effectiveness of caregiver training and oral health education programmes on the oral health outcomes of institutionalised older adults, particularly in terms of denture hygiene and dental plaque levels?</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Institutionalised older adults (older adults residing in long-term care centres, nursing homes and health care facilities) • Intervention: Oral health education or training of caregivers by health care/ para-health care professionals. • Comparison: No active oral health intervention/ usual or routine care. • Outcome: Primary outcome: Evaluation of oral hygiene status (using dental plaque scores) and denture hygiene status (using denture hygiene index scores) in institutionalised older adults for a minimum follow-up of 6 months. [Secondary outcome: As an adjunct, knowledge, attitude and practices (KAP) of caregiver on older persons' oral health.] • Setting: Older adults residing in institutional settings (Galik 2013) like nursing homes, residential facilities, rehabilitation centres and care homes • Study design: Randomised Controlled Trials (RCTs) were considered eligible. Observational studies, case reports, pre-post intervention studies with or without comparators, narrative/ systematic reviews, case reports and letters to the editor were excluded. • Timeframe for follow-up: A minimum follow-up period of 6 months for assessing primary outcomes to ensure the sustained impact of caregiver education interventions on oral hygiene.
Participants	<p>Number of participants: Not reported. 5559 participants totalled from included studies.</p> <p>Age (mean/mode/range): The mean age of the participants ranged from 75.8 years to 86 years.</p> <p>Gender: Not reported</p> <p>Details of any additional relevant participant characteristics:</p>
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p>

Parameter	Extraction items							
	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes
	MacEntee (2007) Canada Long-term care facility	Individually-randomised, parallel-group RCTs	Intervention= 63 Control= 85 Total: 148	Intervention: fulltime nurse educator Control: Dental hygienist	Care-aides participated with a fulltime nurse educator in a seminar about oral health care and had unlimited access to the educator for oral health-related advice.	Care-aides participated in a similar seminar with a dental hygienist, but they received no additional advice.	Follow-up period: 3 months	Oral hygiene, gingival health, masticatory potential, body mass index and malnutrition indicator score, chewing difficulties
	Peltola (2007) Finland Hospital set-up	Individually-randomised, parallel-group RCTs	Group A: 50 Group B: 41 Control= 39 Total: 130	Intervention: dental hygienist	Group A: dental hygienists provided oral hygiene measures for the subjects once every 3 weeks. Group B: nursing staff first received hands-on instructions after which they assumed responsibility for the subjects' daily oral	Group C: received neither intervention nor scheduled dental hygienist visits.	Follow-up period: Mean Group A- 10.5 months Group B - 11.2 months Group- C- 11.6 months	Denture hygiene and dental hygiene

Parameter	Extraction items							
					hygiene. Served as a control			
	Zenthöfer (2013) Germany Long-term care homes	Individually-randomised, parallel-group RCTs	Group 1. 26 Group 2. 27 Group 3. 26 Control: 23 Total: 102	Intervention: Dentist Control: Not reported	G1 No remotivation group: professional cleaning of teeth and dentures. G2 Dentist remotivation group: professional cleaning of teeth and dentures. G3 Staff remotivation group: professional cleaning of teeth and dentures.	No intervention	Follow-up period: 2 weeks, 6 weeks, 12 weeks and 3 years	Mean plaque (plaque control record, O'Leary), gingival bleeding (Ainamo/Bay) and denture hygiene indices.
	Zhang (2021) China Nursing homes	Individually-randomised, parallel-group RCTs	Intervention: 146 Control: 51 Total: 197	Intervention: Dental hygienist Control: Not reported	Alzheimer's disease (AD) patient/caregiver pairs: Each caregiver received oral hygiene instructions and demonstrations from 1 of 2 hygienists. For all	No intervention	Follow-up period: 2 weeks, 4 weeks, 6 weeks	Oral hygiene and gingival health through modified Quigley–Hein Plaque Index (PI) and Gingival Index (GI) respectively.

Parameter	Extraction items							
					<p>caregiver groups, a 15-min educational video on oral hygiene was shown after baseline examinations, covering the role of dental plaque in the development of gingivitis and periodontitis and a detailed description of the modified Bass brushing technique.</p>			
	<p>Frenkel (2001) United Kingdom Nursing homes</p>	<p>Cluster RCTs</p>	<p>Intervention: 178 Control: 200 Total: 378</p>	<p>Intervention: Health promoter of 15 years' experience Control: Not reported</p>	<p>Oral health care education (OHCE) session for caregivers employed in nursing homes and was presented by a health promoter of 15 years' experience.</p>	<p>No intervention</p>	<p>Follow-up period: 1 month, 6 months</p>	<p>Denture plaque, denture-induced stomatitis, dental plaque, gingivitis. Secondary outcome variables: calculus,</p>

Parameter	Extraction items							
								root caries and tooth mobility.
	Frenkel (2002) United Kingdom nursing homes	Cluster RCTs	Intervention: 151 Control: 144 Total: 295	Not reported	Standardised oral health care education session for caregivers.	No intervention	Follow-up period: 1 month, 6 months	Knowledge and attitude mean scores. Excluded
	De Visschere (2011) Belgium nursing homes	Cluster RCTs	Group 1: 211 Group 2: 511 Control: 671 Total: 1393	Intervention: Registered Nurses as oral health coordinator Control: Not reported	Introduction session (1 h) with the director of the institution explaining the rationale and the procedure, appointment of Registered Nurses as oral health coordinators, a half day theoretical and practical training session for all appointed oral health coordinators, oral assessment of all new arrivals,	The control group continued to perform oral hygiene as usual.	Follow-up period: 2 years, 5 years	Denture plaque, dental plaque.

Parameter	Extraction items							
					<p>'individualised oral hygiene plan'. Integration of the 'individualised oral hygiene plan' into daily care, to be performed by all care givers involved in daily care</p>			
	<p>De Visschere (2012) Belgium nursing homes</p>	<p>Cluster RCTs</p>	<p>Intervention: 1003 Control: 984 Total: 1987</p>	<p>Not reported</p>	<p>Supervised implementation of the guideline and the daily oral health care protocol derived from the guideline: A 1.5-h informative oral presentation on the guideline, the daily oral health care protocol, a 2 h lecture and 1 h of practical education for all members of the</p>	<p>Non-supervised implementation of the guideline</p>	<p>Follow-up period: 6 months</p>	<p>Primary outcome variable: oral hygiene level of the participating residents.</p>

Parameter	Extraction items							
					oral health care team and a 1.5 h theoretical and executive education session at each ward, for all ward nurses and care aides.			
	van der Putten (2013) Netherlands care homes	Cluster RCTs	Intervention: 177 Control:165 Total: 342	Intervention: dental hygienist Control: Not reported	Supervised implementation of the 'Oral health care Guideline for Older people in Long-term care Institutions' (OGOLI) and a daily oral health care protocol derived from the OGOLI. The implementation of the guideline was supervised by a dental hygienist during the 6-month study period. The various elements of the	Oral health care according to the no-supervised implemented OGOLI.	Follow-up period: 6 months	Dental and denture plaque scores.

Parameter	Extraction items							
					<p>intervention included the following: A 1.5 h informative oral presentation on the guideline, the daily oral health care protocol and the supervised implementation project before the start of the study. A 2 h lecture and 3 h of practical education for the ward oral health care organiser (WOO). A 1.5 h theoretical and practical education session at ward level, presented by the ward's WOO using all education materials received from the dental</p>			

Parameter	Extraction items							
					hygienist, for all ward nurses and nurse assistants.			
	Khanagar (2014) India older people homes	Cluster RCTs	Intervention: 38 Control: 40 Total: 78	Intervention: health educator Control: Not reported	Oral health education was provided to the caretakers of the intervention group. The health educator gave a PowerPoint presentation on oral health to the caretakers and a live demonstration of oral hygiene techniques on study models. Also, a health education CD and manual were provided to the respective institutions.	Oral health education was given to the caretakers of the control group at the end of 6 months.	Follow-up period: 6 months	Oral health knowledge scores Excluded
	Khanagar (2015) India	Cluster RCTs	Intervention: 162 older people and 38 caregivers	Intervention: investigator Control: Not reported	The investigator gave a PowerPoint presentation on oral health to	Oral-health education was given to the caretakers of the control	Follow-up period: 6 months	Levels of debris, plaque of dentate and denture

Parameter	Extraction items							
	older people homes		Control: 160 older people and 40 caregivers Total: 400		the caretakers. A health education CD and manual were also provided to the respective institutions.	group at the end of 6 months.		plaque, and denture stomatitis of denture wearing residents
	Janssens (2016) Belgium nursing homes	Cluster RCTs	Intervention: 165 Control: 94 Total: 259	Intervention: dental hygienist Control: Not reported	The intervention included the implementation of an oral health care protocol and three different educational stages. One of the investigators supervised the implementation process, supported by a dental hygienist.	The intervention was implemented to the control nursing homes after completion of the data collection.	Follow-up period: 6 months	Nurses' and nurses' aides' knowledge on oral health and oral hygiene and their attitude Excluded
	Zenthöfer (2016) Germany nursing homes	Cluster RCTs	Intervention: 188 Control: 75 Total: 263	Not reported	A two-day comprehensive education programme for the carers and the implementation of ultrasound baths for	No intervention	Follow-up period: 6 months	Plaque Control Record (PCR), Gingival Bleeding Index (GBI), Denture Hygiene

Parameter	Extraction items							
					denture cleaning. For the educational part of the interventions, as many carers as possible were targeted to participate in the lectures. Therefore, the lectures were offered twice for each nursing home.			Index (DHI) and Community Periodontal Index of Treatment Needs (CPITN) Excluded
	Weintraub (2018) United States nursing homes	Cluster RCTs	Intervention: 121 Control: 98 Total: 219	Not reported	The intervention consisted of training NH staff in the Mouth Care Without a Battle (MCWB) protocol and providing support in its use for 2 years.	No intervention	Follow-up period: 24 months	Plaque Index for Long-Term Care, the Gingival Index for Long-Term Care and the Denture Plaque Index

Countries (no. studies) (in alphabetic order):

Setting/context

- Belgium (2 studies: De Visschere (2011), De Visschere (2012))
- Canada (1 study: MacEntee (2007))
- China (1 study: Zhang (2021))

Parameter	Extraction items
	<ul style="list-style-type: none"> • Finland (1 study: Peltola (2007)) • Germany (2 studies: Zenthöfer (2013), Zenthöfer (2016)) • India (1 study: Khanagar (2015)) • The Netherlands (1 study: van der Putten (2013)) • United Kingdom (1 study: Frenkel (2001)) • United States (1 study: Weintraub (2018)) <p>Setting (no. studies):</p> <ul style="list-style-type: none"> • Care homes (1 study: van der Putten (2013)) • Hospital (1 study: Peltola (2007)) • Long-term care facility (2 studies: MacEntee (2007), Zenthöfer (2013)) • Nursing homes (6 studies: Zhang (2021), Frenkel (2001), De Visschere (2011), De Visschere (2012), Zenthöfer (2016), Weintraub (2018)) • Older people homes (1 study: Khanagar (2015)) <p>Other relevant features: N/A</p>
Databases and sources searched	<p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> • If published, number and link: CRD42022309962 https://www.crd.york.ac.uk/PROSPERO/view/CRD42022309962 <p>Number and names of databases: 4 databases</p> <ul style="list-style-type: none"> • Cochrane Central Register of Controlled Trials • PubMed/ MEDLINE • Scopus • Web of Science <p>Other non-database sources: Hand searching of journals</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes • Reference chasing: No • Expert consultation: No

Parameter	Extraction items
	<p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: The included trials were published in the last two decades between 2001 and 2021.</p> <p>Search limits (e.g. date, language): English</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes <p>Screening completed in duplicate: titles and abstracts were independently evaluated by two authors, full texts of all potentially eligible studies were screened by the same two reviewers.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported. Any discrepancies were deliberated in the presence of a third reviewer, and decisions were reached unanimously <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported Inter-examiner discrepancies were resolved through deliberation among the reviewers and, if necessary, by seeking the counsel of the third reviewer <p>Funding of review: None reported</p> <p>Conflicts of interest declared: The authors declare no conflicts of interest.</p> <p>If declared, how conflicts of interest were managed: NA</p> <p>Date range for included studies relevant to this overview of reviews: 2001-2021</p> <p>Exact years of publication of studies relevant to this overview of reviews:</p> <p>2001 (1 study: Frenkel (2001))</p> <p>2007 (2 studies: MacEntee (2007), Peltola (2007))</p> <p>2011 (1 study: De Visschere (2011))</p> <p>2012 (1 study: De Visschere (2012))</p> <p>2013 (2 studies: Zenthöfer (2013), van der Putten (2013))</p> <p>2015 (1 study: Khanagar (2015))</p> <p>2016 (1 study: Zenthöfer (2016))</p> <p>2018 (1 study: Weintraub (2018))</p> <p>2021 (1 study: Zhang (2021))</p>
<p>Date Range (years) of included studies</p>	<p>Number of primary studies: 14 studies included. 11/14 studies relevant to this overview of reviews.</p> <p>Number of studies by study design:</p>

Parameter	Extraction items
	<ul style="list-style-type: none"> Individually-randomised, parallel-group RCTs: 4 studies (MacEntee (2007), Peltola (2007), Zenthöfer (2013), Zhang (2021)) Cluster RCTs: 7 studies (Frenkel (2001), De Visschere (2011), De Visschere (2012), van der Putten (2013), Khanagar (2015), Zenthöfer (2016), Weintraub (2018)) <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: No</p> <p>Planned study design(s) to be included: Randomised Controlled Trials (RCTs) were considered eligible.</p> <p>Reasons for including study design(s) provided? No</p>
Types of studies included	<ul style="list-style-type: none"> If yes, describe the reasons(s): NA <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane RoB 2 tool and RoB 2 CRT</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> Concealment of allocation: Yes Blinding of assessors: Yes Sequence allocation (individual vs group randomisation): Yes Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: NA</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>High risk of bias (low quality) (k=2 : Khanagar (2015), Weintraub (2018))</p> <p>Unclear/moderate risk of bias (unclear/moderate quality) (k=7 : MacEntee (2007), Peltola (2007), Zenthöfer (2013), De Visschere (2011), De Visschere (2012), van der Putten (2013), Zenthöfer (2016))</p> <p>Low risk of bias (high quality) (k=2 : Zhang (2021), Frenkel (2001))</p>

Parameter	Extraction items
	<p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): The authors explicitly state: "Three studies showed a 'high risk of bias', and five studies showed 'some concerns'"</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes The authors appropriately addressed this limitation: "The results could still be subjected to some uncertainty given the moderate to high statistical heterogeneity observed in the pooled analysis" They also note in their limitations section: "The degree of certainty with which we can infer conclusions regarding the effectiveness of educational programs is constrained by the quality of the evidence in this study." <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? NA • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): NA
Method of analysis	<p>Authors description of method of analysis (include page number):</p> <p>"Review Manager Version 5.4.1 was used for quantitative analysis. To ensure homogeneity among the pooled studies and to avoid producing misleading results, the minimum follow-up time period to evaluate oral/denture hygiene status was specified as 6 months. Continuous data expressed as mean (SD) were subjected to an inverse variance test. Standardised mean difference (SMD) with a 95% confidence interval (95% CI) statistic was employed because of variability in the scales used to evaluate outcomes (Higgins et al. 2019). A p-value < 0.05 was assessed as statistically significant. A random effects model was used because of the presence of clinical heterogeneity among reports. Sub-group analysis was done with respect to the cognitive ability of the study population. The I2 statistic quantified statistical heterogeneity among included studies. An I2 value of more than 50% was regarded as moderate to high heterogeneity (Higgins et al. 2011)." P4</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis:

Parameter	Extraction items
	<p>The authors conducted a meta-analysis to quantitatively synthesize evidence on caregiver education effectiveness, despite only including 4 of 14 studies. They justified using Standardized Mean Difference (SMD) because different scales were used across studies to measure dental plaque and denture hygiene outcomes. A random effects model was chosen due to clinical heterogeneity among studies, with a minimum 6-month follow-up required to ensure meaningful assessment of intervention sustainability. The authors acknowledged that heterogeneity and limited study inclusion constrained the certainty of their conclusions, but felt meta-analysis would provide valuable pooled estimates to augment existing evidence in this field where previous reviews had yielded inconclusive results.</p> <ul style="list-style-type: none"> • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes The authors appropriately: <ul style="list-style-type: none"> • Used inverse variance weighting • Applied random effects model to account for clinical heterogeneity • Calculated I² statistics (reported as 42% for denture hygiene and 35% for dental plaque) • Conducted subgroup analysis based on cognitive ability to explore sources of heterogeneity <p>The authors acknowledge: "moderate to high statistical heterogeneity observed in the pooled analysis" as a limitation affecting certainty of conclusions. p15</p> <p>For prospective cohort studies: NA</p>

Outcomes assessed	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Denture hygiene index • Primary outcome 2: Dental plaque
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Results/findings		META-ANALYSIS FINDINGS						
		Primary outcomes						
Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Oral hygiene status	Oral health education or	Dental plaque scores	4 studies: De Visschere (2012),	SMD	p<0.0001	35%	n=236 (experimental) n=194 (control)	

Parameter	Extraction items								
(using dental plaque scores)	training vs control		Frenkel (2001), Van Der Putten (2013), Zenthofer (2016)	-0.51 (95% CI -0.76, -0.26)				The present pooled analysis of data from four trials favours caregiver education and training programmes significantly reduce dental plaque scores among institutionalised older adults. SMD -0.51 (95% CI -0.76, -0.26) p<0.0001, I²=35%	
Denture hygiene status (using denture hygiene index scores)	Oral health education or training vs control	Denture hygiene index	4 studies: Van Der Putten (2013), Zenthofer (2016), De Visschere (2012), Frenkel (2001)	SMD -0.85 (95% CI -1.53, -0.18)	p=0.01	95%	n=445 (experimental) n=384 (control) Our review shows that caregiver education and training programmes significantly improve denture hygiene among institutionalised older adults. SMD -0.85 (95% CI -1.53, -0.18), p=0.01, I²=95% Less so for those with no cognitive impairment		

Separate summaries reported for RCTs and non-randomised studies when included in the same review? NA

Heterogeneity

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

Parameter	Extraction items
	<p>The authors acknowledge that "The results could still be subjected to some uncertainty given the moderate to high statistical heterogeneity observed in the pooled analysis" (P15). They also state that heterogeneity among studies was one factor that "brings about heterogeneity among the studies" affecting outcome interpretation (P14).</p> <p>Causes of heterogeneity investigated? Yes</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • Subgroup analysis based on cognitive ability of study population (page 4) • I² statistic to quantify heterogeneity (>50% considered moderate to high) • Random effects model to account for clinical heterogeneity • If yes, provide a brief indication of the extent of heterogeneity in the relevant results: <p>The authors identified multiple sources of heterogeneity: "Intervention duration, intensity, components and delivery mode are some of the factors that impacted the outcomes, bringing about heterogeneity among the studies" (P14). They also noted that "variability in the scales used to evaluate outcomes" contributed to heterogeneity, justifying their use of SMD.</p>
Comments	N/A

Nazari *et al.* (2025) – Extraction form

Parameter	Extraction items
First author and year of publication	Nazari <i>et al.</i> (2025)
Review title	Health promotion theory-based educational interventions for improving oral health in children and adolescents: a systematic review and meta-analysis
Review coding	<p>Providers: Some unclear providers</p> <p>Participants: Children and adolescents</p> <p>Interventions: Theory-based interventions</p>
Contributing primary studies	The information presented in this extraction form applies only to 19/19 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.

Parameter	Extraction items																
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “The present systematic review and meta-analysis were performed with the objective of assessing the effectiveness of theory-Based health education and promotion interventions in impacting oral health outcomes among children and adolescents.” p1</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Children and adolescents aged 5–18 years. • Intervention: Theory-Based oral health education or promotion interventions (e.g., the Health Belief Model (HBM), Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT)). • Comparison: Not reported • Outcome: At least one oral health-related outcome (e.g., behavior, knowledge, attitudes, self-efficacy, plaque index, gingival index, DMFT). • Setting: Not reported • Study design: Randomized controlled trials (RCTs). • Timeframe for follow-up: Not reported 																
Participants	<p>Number of participants: 6560 participants</p> <p>Age (mean/mode/range): The age of participants ranged from 5 to 18 years</p> <p>Gender: male and female</p> <p>Details of any additional relevant participant characteristics:</p>																
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review: Primary outcomes (as defined by systematic review authors) are the only outcomes of interest</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes</th> </tr> </thead> <tbody> <tr> <td>Haleem (2012) Pakistan</td> <td>Cluster RCT</td> <td>1517 10-11 year olds</td> <td>Dentist</td> <td>Dentist-led education with monthly reinforcement</td> <td>Waitlist</td> <td>Follow-up duration (months)=6</td> <td>Oral health knowledge, hygiene behavior,</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes	Haleem (2012) Pakistan	Cluster RCT	1517 10-11 year olds	Dentist	Dentist-led education with monthly reinforcement	Waitlist	Follow-up duration (months)=6	Oral health knowledge, hygiene behavior,
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes										
Haleem (2012) Pakistan	Cluster RCT	1517 10-11 year olds	Dentist	Dentist-led education with monthly reinforcement	Waitlist	Follow-up duration (months)=6	Oral health knowledge, hygiene behavior,										

Parameter	Extraction items							
								plaque scores
	Ghorbani (2018) Iran	RCT	100 Female junior high school students	Not reported	5 sessions (lectures, role-play, group discussion, model demonstration)	Routine curriculum (no intervention)	Follow-up duration (months)=2	Flossing behavior, self-efficacy, planning constructs
	Bilu Xiang (2022) Hong Kong	Cluster RCT	1159	Peers	Peer-led oral health intervention (6 sessions)	Booklets only	Follow-up duration (months)=12	Oral cleanliness score, plaque accumulation Oral health-related quality of life
	Sanaei-nasab (2022) Iran	RCT	112 6-12 year olds	Not reported	Five weekly 1-hour educational sessions + SMS reminders	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Zareban (2022) Iran	RCT	160 12-18 year olds	Not reported	Educational program	Routine education (control group)	Follow-up duration (months)=6	Knowledge, attitude, practice, clinical oral health indices

Parameter	Extraction items							
								(plaque index, gingival health)
	Scheerman (2019) Iran	Cluster RCT	253 12-17 year olds	Not reported	Telegram-based social media platform	Waitlist	Follow-up duration (months)=6	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health) Oral health-related quality of life
	Aleksejuniene (2015) Lithuania	Cluster RCT	197 15-16 year olds	Not reported	Three hands-on educational sessions and peer support	Waitlist	Follow-up duration (months)=12	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Dziaugyte (2017) Lithuania	Cluster RCT	206 15-16 year olds	Dentist	Five individualized sessions by dentist	Conventional one time instruction	Follow-up duration (months)=12	Knowledge, attitude, practice, clinical oral

Parameter	Extraction items							
								health indices (plaque index, gingival health)
	Wu (2017) Hong Kong	RCT	512 12-13 year olds	Not reported	Motivational Interviewing and Risk Assessment	Prevailing Education (PE)	Follow-up duration (months)=12	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Marashi (2024) Iran	RCT	80 13-15 year olds	Not reported	3-week mobile app education and group briefings	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Gholami (2015) Iran	Cluster RCT	166 11-15 year olds	Not reported	Brief self-regulatory intervention (planning, intention,	Passive control (no intervention)	Follow-up duration (months)=1	Knowledge, attitude, practice, clinical oral health

Parameter	Extraction items							
					coping, self- efficacy)			indices (plaque index, gingival health)
	Yekaninejad (2012) Iran	RCT	392 11-12 year olds	Not reported	3 sessions for students + parents + school staff	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Ghaffari (2021) Iran	RCT	250 6-12 year olds	Not reported	Delivered through six sessions for students, three sessions for parents, and two sessions for teachers.	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Movaseghi (2022) Iran	RCT	162 14-15 year olds	Not reported	Four weekly 1- hour sessions (lectures, group discussion, role play, puzzle,	Waitlist	Follow-up duration (months)=1	Knowledge, attitude, practice, clinical oral health indices

Parameter	Extraction items							
					booklets, videos)			(plaque index, gingival health)
	Nammontri (2012) Thailand	Cluster RCT	261 10-12 year olds	Not reported – trained teachers	Seven 40 to 60 min sessions over 2 months (class-room and whole-school projects)	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health) Oral health-related quality of life
	Naseri-Salahshour (2019) Iran	Cluster RCT	470 11-13 year olds	Not reported	Three 45-min sessions (lectures, group discussions, practical demos)	Standard school health training	Follow-up duration (months)=1	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Pakpour (2013) Iran	Cluster RCT	126 15.3 year olds	Not reported	Pamphlet messages (loss-frame)	Waitlist	Follow-up duration (months)=6	Knowledge, attitude, practice, clinical oral

Parameter	Extraction items							
								health indices (plaque index, gingival health) Oral health-related quality of life
	Shirahmadi (2024) Iran	RCT	190 11-12 year old girls	Not reported	10 educational sessions for students, 1 session for mothers + pamphlets, posters, Telegram group, ceremony	Waitlist	Follow-up duration (months)=3	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)
	Brukiene (2012) Lithuania	RCT	247 12-12 year olds	Not reported	Parent-Teen Agreement (PTA), newsletters, phone calls	control group 1 (plaque disclosure)	Follow-up duration (months)=12	Knowledge, attitude, practice, clinical oral health indices (plaque index, gingival health)

Parameter	Extraction items
Setting/context	<p>Countries (no. studies) (in alphabetic order):</p> <p>Hong Kong – 2 studies (Bilu Xiang (2022), Wu (2017))</p> <p>Iran – 12 studies (Ghorbani (2018), Sanaeinasab (2022), Zareban (2022), Scheerman (2019), Marashi (2024), Gholami (2015), Yekaninejad (2012), Ghaffari (2021), Movaseghi (2022), Naseri-Salahshour (2019), Pakpour (2013), Shirahmadi (2024))</p> <p>Lithuania – 3 studies (Aleksejuniene (2015), Dziaugyte (2017), Brukiene (2012))</p> <p>Pakistan – 1 study (Haleem (2012))</p> <p>Thailand – 1 study (Nammontri (2012))</p> <p>Setting (no. studies): Not reported</p> <p>Other relevant features:</p> <p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> If published, number and link: CRD420251026862 https://www.crd.york.ac.uk/PROSPERO/view/CRD420251026862
Databases and sources searched	<p>Number and names of databases: 4 databases (search conducted from January to March 2025)</p> <ul style="list-style-type: none"> PubMed Web of Science Scopus Cochrane Library <p>Other non-database sources: Not reported</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> Grey literature search: Yes Reference chasing: Yes Expert consultation: No

Parameter	Extraction items
Date Range (years) of included studies	<p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: Up to March 2025.</p> <p>Search limits (e.g. date, language): Published in English</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported. They resolved any disagreements by discussion or referral to a fourth author <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.</p> <p>Conflicts of interest declared: The authors declare no competing interests.</p> <p>If declared, how conflicts of interest were managed: NA</p> <p>Date range for included studies relevant to this overview of reviews: 2012-2024</p> <p>Exact years of publication of studies relevant to this overview of reviews:</p> <ul style="list-style-type: none"> • 2012 - 4 studies (Haleem (2012), Yekaninejad (2012), Nammontri (2012), Brukiene (2012)) • 2013 - 1 study (Pakpour (2013)) • 2015 - 2 studies (Aleksejuniene (2015), Gholami (2015)) • 2017 - 2 studies (Dziaugyte (2017), Wu (2017)) • 2018 - 1 study (Ghorbani (2018)) • 2019 - 2 studies (Scheerman (2019), Naseri-Salahshour (2019)) • 2021 – 1 study (Ghaffari (2021)) • 2022 - 4 studies (Bilu Xiang (2022), Sanaeinasab (2022), Zareban (2022), Movaseghi (2022)) • 2024 - 2 studies (Marashi (2024), Shirahmadi (2024))
Number of primary studies included in the systematic review	<p>Number of primary studies: 19 primary studies</p> <p>Number of studies by study design:</p> <ul style="list-style-type: none"> • RCT - 10 studies (Ghorbani (2018), Sanaeinasab (2022), Zareban (2022), Wu (2017), Marashi (2024), Yekaninejad (2012), Ghaffari (2021), Movaseghi (2022), Shirahmadi (2024), Brukiene (2012)) • Cluster RCT - 9 studies (Haleem (2012), Bilu Xiang (2022), Scheerman (2019), Aleksejuniene (2015), Dziaugyte (2017), Gholami (2015), Nammontri (2012), Naseri-Salahshour (2019), Pakpour (2013))

Parameter	Extraction items
Types of studies included	Funding of primary studies: No
	Conflicts of interest of primary studies: No
	Planned study design(s) to be included: Randomized controlled trials (RCTs)
	Reasons for including study design(s) provided? No <ul style="list-style-type: none"> If yes, describe the reasons(s): NA
Appraisal instruments used	List of excluded studies at full text provided? Yes
	Reasons for exclusion provided? Yes
	Full name of tool(s) used: Cochrane Risk of Bias Tool (RoB 2.0)
	<p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> Concealment of allocation: Yes Blinding of assessors: Yes Sequence allocation (individual vs group randomisation): Yes Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: NA</p> <ul style="list-style-type: none"> Confounding: Yes/No Selection bias: Yes/No Exposure and outcomes: Yes/No Selective reporting: Yes/No
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>15 studies were rated as having a low risk of bias, 2 studies had a high risk of bias, and 2 studies had some concerns.</p> <ul style="list-style-type: none"> High risk of bias (low quality) (k=2) - Sanaeinasab (2022), Zareban (2022) Unclear/moderate risk of bias (unclear/moderate quality) (k=2) - Aleksejuniene (2015), Dziaugyte (2017) Low risk of bias (high quality) (k=15) - Ghorbani (2018), Wu (2017), Marashi (2024), Yekaninejad (2012), Ghaffari (2021), Movaseghi (2022), Shirahmadi (2024), Brukiene (2012), Haleem (2012), Bilu Xiang (2022), Scheerman (2019), Gholami (2015), Nammontri (2012), Naseri-Salahshour (2019), Pakpour (2013)

Parameter	Extraction items
	<p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): Not reported</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No - The review included all 19 RCTs regardless of risk of bias rating, including the 2 with high risk and 2 with some concerns. • Only low risk of bias RCTs included in meta-analysis: No - All 19 studies were included in the meta-analyses. • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? The authors used two methods to assess publication bias: • Visual assessment of funnel plots - Though the actual funnel plots are mentioned as being in Supplementary Material S5 (p 3-4) (figure 5 and figure 7 relevant to outcomes of interest for current overview: • Egger's weighted regression test - A statistical test for detecting small-study effects that may indicate publication bias (p 3) • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): The authors consistently note that "smaller studies may have influenced the overall results" (p11) and acknowledge in their discussion that "publication bias was present for several primary outcomes" (p11). However, they do not discuss the potential magnitude of this bias or how it might affect the interpretation of their findings. For OHRQoL authors noted Egger's test indicated the presence of publication bias, as evidenced by significant small-study effects (p = 0.014). For OHB authors noted Egger's test indicated the presence of publication bias (p = 0.008).
Method of analysis	<p>Authors description of method of analysis (include page number): The authors describe their analytical approach: (p3-4)</p> <ul style="list-style-type: none"> • Used random-effects meta-analysis with standardized mean differences (SMD) and 95% CI

Parameter	Extraction items
	<ul style="list-style-type: none"> • Calculated mean changes and standard deviations for effect size estimation • When SD not reported, calculated using formula: $S.D_{change} = \sqrt{[(S.D_{baseline}^2 + S.D_{final}^2) - (2 \times R \times S.D_{baseline} \times S.D_{final})]}$ with correlation coefficient $R=0.8$ • For graphical data, used GetData Graph Digitizer 2.24 for extraction • Conducted subgroup analyses based on: Year of Publication, Country, Sample Size, and Follow-up Duration • Performed sensitivity analysis using leave-one-out approach • Assessed heterogeneity using I^2 statistic • All analyses performed using Stata software version 21 <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: The authors chose random-effects meta-analysis over fixed-effect model because: "A random-effects model was chosen over a fixed-effect model because heterogeneity was expected due to differences in study populations, intervention delivery methods, different measurement tools, theoretical frameworks, and follow-up durations. This approach accounts for both within-study and between-study variability, providing more generalizable estimates." (p3) • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes - The authors: <ul style="list-style-type: none"> • Used random-effects model which is appropriate given expected heterogeneity • Properly weighted studies by calculating pooled standard deviations • Accounted for heterogeneity through: <ul style="list-style-type: none"> • Choice of random-effects model (rather than fixed-effects) • Reporting I^2 statistics for all analyses • Conducting subgroup analyses to explore sources of heterogeneity

Parameter	Extraction items
	<ul style="list-style-type: none"> Acknowledging high heterogeneity throughout (I^2 values often >90%) <p>RCTs and cRCTs are combined in the OHB meta-analysis without any comment on adjusting for this?</p> <p>For prospective cohort studies: NA</p> <ul style="list-style-type: none"> Statistical combination of data adjusted for confounding (not raw data): Yes/No Authors' justification for combination of raw data where adjusted estimates were not available (include page number): Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes/No

Outcomes assessed

List of authors' primary outcomes:

- Primary outcome 1: Effectiveness of the intervention on self-efficacy related to oral health
- Primary outcome 2: Effectiveness of the intervention on oral health knowledge (not extracted)
- Primary outcome 3: Effectiveness of the intervention on oral health attitude (not extracted)
- Primary outcome 4: Effectiveness of the intervention on oral health-related quality of life (OHRQoL)
- Primary outcome 5: Effectiveness of the intervention on oral health behavior

List of author's secondary outcomes: Not extracted, as per protocol

- Secondary outcome 1: Effectiveness of the intervention on periodontal health
- Secondary outcome 2: Effectiveness of the intervention on dental plaque
- Secondary outcome 3: Effectiveness of the intervention on DMFT scores

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I^2 (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
	Oral health-related	Theory-based educational	OHRQoL	4 studies, 9 comparisons -Scheerman	SMD 7.38 (95% CI	p < 0.001	99.7 %	n=4751 (inaccurate overcounting of	

Parameter	Extraction items								
	quality of life (OHRQoL)	interventions vs. Control		(2019), Nammontri (2012), Pakpour (2013), Xiang (2022)	5.57, 9.19)			<p>participants – therefore cannot use data)</p> <p>Data from 4 studies (9 reports) [9, 19, 23, 32] involving 4751 participants were analyzed to evaluate the impact of interventions on oral health–related quality of life (OHRQoL). The pooled standardized mean difference (SMD) was 7.38 (95% CI: 5.57, 9.19; p < 0.001), indicating a statistically significant and substantial improvement in OHRQoL following the interventions (Fig. 4). This large effect size suggests that participants experienced meaningful enhancements in their daily functioning, comfort, and well-being related to oral health. Considerable heterogeneity was observed across studies ($I^2 = 99.7%$, $p < 0.001$). Subgroup analyses by publication year, country, and follow-up duration revealed variability in effect</p>	

Parameter	Extraction items								
								<p>sizes; notably, studies conducted in Iran and those published after 2015 reported greater improvements in OHRQoL. Studies from countries other than Iran contributed substantially to heterogeneity (Supplementary Material S4). Sensitivity analyses confirmed the robustness of the overall findings, with no single study exerting undue influence (Supplementary Material S5). However, Egger’s test indicated the presence of publication bias, as evidenced by significant small-study effects ($p = 0.014$).</p>	
	<p>Oral health behavior</p>	<p>Theory-based educational interventions vs. Control</p>	<p>Not reported</p>	<p>11 studies, 29 comparisons – Dziaugyte (2017), Haleem (2012), Shirahmadi (2024), Marashi</p>	<p>SMD 2.58 (95% CI 2.03, 3.12)</p>	<p>$p < 0.001$</p>	<p>99.2%</p>	<p>n=13973 (inaccurate overcounting of participants – therefore cannot use data)</p> <p>Data from 11 studies (29 reports) encompassing 13,973 participants, were analyzed to assess the impact of theory-Based</p>	

Parameter	Extraction items								
				(2024), Movaseghi (2022), Nasari- Salahshour (2019), Nammontri (2012), Scheerman (2019), Xiang (2022), Pakpour (2013), Gholami (2014)				<p>interventions on oral health behavior. The overall pooled standardized mean difference (SMD) was 2.58 (95% CI: 2.03, 3.12; p < 0.001), indicating a statistically significant and substantial improvement in oral health behaviors following the interventions (Fig. 7). Considerable heterogeneity was observed among studies ($I^2 = 99.2\%$, $p < 0.001$). Subgroup analyses by publication year, country, sample size, and follow-up duration revealed variability in effect sizes; notably, interventions conducted in Iran, those with smaller sample sizes, and studies with shorter follow-up periods showed stronger effects(Supplementary Material S4). Sensitivity analysis confirmed the robustness of the pooled estimate, with no single study unduly influencing the results(Supplementary</p>	

Parameter	Extraction items								
								Material S5). Egger's test indicated the presence of publication bias (p = 0.008).	
Separate summaries reported for RCTs and non-randomised studies when included in the same review? NA									

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

Authors acknowledged high heterogeneity throughout:

- Page 4 - Self-efficacy: "Significant heterogeneity was observed across studies ($I^2 = 98.0\%$, $p < 0.001$)"
- Page 4 - OHRQoL: "Considerable heterogeneity was observed across studies ($I^2 = 99.7\%$, $p < 0.001$)"
- Page 5 - Knowledge: "Significant heterogeneity was observed among studies ($I^2 = 96.2\%$, $p < 0.001$)"
- Page 7 - Behavior: "Considerable heterogeneity was observed among studies ($I^2 = 99.2\%$, $p < 0.001$)"
- Page 11 - Discussion: The authors acknowledge "extensive heterogeneity between outcomes" and suggest this variation is "understandable in behavior change interventions"

Causes of heterogeneity investigated? Yes

- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**
- Subgroup analyses based on: (p3)
- Year of publication (before/after 2015)
- Country (Iran vs. other countries)
- Sample size (≤ 500 vs. > 500)
- Follow-up duration
- Sensitivity analyses using leave-one-out approach to identify influential studies (p3)
- **If yes, provide a brief indication of the extent of heterogeneity in the relevant results:**

Key findings from subgroup analyses (Supplementary Material S4, mentioned throughout):

- **Geographic variation:** Studies from Iran consistently showed stronger effect sizes across outcomes
- **Publication year:** Studies published after 2015 generally showed stronger effects
- **Sample size:** Smaller studies (≤ 500 participants) tended to report higher effect sizes
- **Follow-up duration:** Shorter follow-up periods associated with larger effect sizes

Heterogeneity

Parameter	Extraction items
	The authors identify potential causes: (p13)
	"These include cultural environment differences (e.g., health beliefs, dental care norms), intervention intensity and duration, mode of delivery (e.g., computerized versus face-to-face), target age groups for intervention, and baseline levels of oral health literacy"

Comments

Priya *et al.* (2019) – Extraction form

Parameter	Extraction items
First author and year of publication	Priya <i>et al.</i> (2019)
Review title	Effectiveness of school dental health education on the oral health status and knowledge of children: A systematic review.
Review coding	School children; Schools-based; Mixed providers;
Contributing primary studies	The information presented in this extraction form applies only to the 11/18 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): Review authors planned to assess the interventional studies on the effectiveness of school dental health education on the oral health-related knowledge, attitude, and practice behavior and oral health status of 6–12-year-old children, with a minimum follow-up period of 6 months. (page 437)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: schoolchildren aged 6–12 years • Intervention: any mode of oral health education (OHE) • Comparison: not specified/ no information provided • Outcome: oral health-related knowledge, attitude, and practice behavior and oral health status • Setting: schools • Study design: interventional studies • Timeframe for follow-up: a minimum follow-up period of 6 months
Participants	Number of participants: not reported. Totalled based on participant numbers reported for each of the 11 included studies: 14,698

Parameter	Extraction items																														
Description of Interventions/ phenomena of interest	Age (mean/mode/range): 6 – 12-year-olds across the individual studies Gender: no information provided Details of any additional relevant participant characteristics: Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health. Overview of relevant characteristics of primary studies included in systematic review: Primary outcomes (as defined by systematic review authors) assessed the changes in the practice behaviour of children following intervention and are the only outcomes of interest to this current review																														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Primary study</th> <th style="text-align: left;">Study design</th> <th style="text-align: left;">No. participants</th> <th style="text-align: left;">Provider</th> <th style="text-align: left;">Intervention</th> <th style="text-align: left;">Comparator</th> <th style="text-align: left;">Duration</th> <th style="text-align: left;">Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td>Houle 1982 US</td> <td>NRCT</td> <td>N=198 6-year-olds</td> <td>Classroom teacher and dental hygienist</td> <td>School 1 Health curriculum - 3 to 4 lessons for 3 weeks/year + Dental health education by classroom teacher and dental hygienist. Oral prophylaxis and fluoride application annually. School 2 same dental health education</td> <td>School 3 – no intervention</td> <td>3 to 4 lessons for 3 weeks/year Follow-up at 5 years</td> <td>Questionnaire Podshadley's Patient hygiene performance (PHP) index</td> </tr> <tr> <td>Redmond 1999 UK</td> <td>Crossover RCT</td> <td>N=1063 12-year-olds</td> <td>Dental facilitator</td> <td>OHE in 10 per group for 20 minutes Leaflet,</td> <td>No intervention</td> <td>3 lessons in each 6</td> <td>Questionnaire Plaque index</td> </tr> </tbody> </table>							Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest	Houle 1982 US	NRCT	N=198 6-year-olds	Classroom teacher and dental hygienist	School 1 Health curriculum - 3 to 4 lessons for 3 weeks/year + Dental health education by classroom teacher and dental hygienist. Oral prophylaxis and fluoride application annually. School 2 same dental health education	School 3 – no intervention	3 to 4 lessons for 3 weeks/year Follow-up at 5 years	Questionnaire Podshadley's Patient hygiene performance (PHP) index	Redmond 1999 UK	Crossover RCT	N=1063 12-year-olds	Dental facilitator	OHE in 10 per group for 20 minutes Leaflet,	No intervention	3 lessons in each 6	Questionnaire Plaque index
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Parameter	Extraction items							
					toothbrushes, toothpaste and disclosing tablets		month period Follow-up at 1 year	
	Worthington 2001 England	cRCT	N=898 10-year-olds	Dental nurse	OHE, diet, tooth brushing instruction, provided with dental aids	No intervention	4 One-hour session with group activity Follow-up at 7 months	Questionnaire Plaque index
	Frencken 2001 Zimbabwe	NRCT	N=965 7–9-year-olds	School teachers	OHE lectures and competitions Duration/frequency not reported	No intervention	Follow-up at 3.5 years	Oral hygiene index Excluded as secondary outcome only
	Vanobbergen 2004 Belgium	NRCT	N=5268 7–11-year-olds	Dentists	Lectures on fluorides, dietary habits and dental attendance. Oral health promotion	No intervention	1 hour session once a year Follow-up at 6 years	Sulcular bleeding index Questionnaire Plaque index
	Petersen 2004 China	NRCT	N=918 6-year-olds	School teachers	OHE and supervised tooth brushing	No intervention	at least twice in each semester or 4 times a year Follow-up at 3 years	Gingival bleeding index Excluded as secondary outcome only
	Peng 2004 China	NRCT	N=1143 6–7-year-olds	School teachers	OHE + tooth brushing +/- sugar free chewing gum	No intervention	Follow-up at 2 years	Bleeding on probing index

Parameter	Extraction items							
								Excluded as secondary outcome only
	Valle 2004 Brazil	NRCT	N=325 6-11-year-olds	Dentists	Monthly lectures using macromodels, brushes, puppets, posters and panels	No intervention	Monthly lectures. Follow-up at 10 months	Quigley-Hein modified plaque index Eastman interdental bleeding index 'No caries saliva' test Excluded as secondary outcome only
	Al-Jundi 2006 Jordan	NRCT	N=856 6-year-olds	Dentists	Oral hygiene instruction sessions Traditional lectures with colour posters and models. Supervised tooth brushing.	Oral hygiene instructions	30-minute sessions, 5 consecutive school days, twice a year. Follow-up at 4 years	DMFT index deft index Excluded as secondary outcome only
	Zanin 2007 Brazil	NRCT	N=60 6-12-year-olds	Dentists	Group discussion with participation of 10 students A puppet play was performed to stimulate health education.	Supervised tooth brushing once a year. Professional fluoride applications	4 lectures x 30 minutes each Follow-up at 1.3 years	Gingival index Plaque index Excluded as secondary outcome only
	Tolvanen 2009 Finland	RCT	N=2498 6-year-olds	Dentists	OHE brushing teeth, healthy	Regular check-ups	Follow-up at 3.4 years	Questionnaire

Parameter	Extraction items							
					eating habits using videos, power point presentations, plays, posters	Preventive treatments		
	Tai 2009 China	Block RCT	N=1616 11–12-year-olds	School teachers	Oral health instruction, booklet, annual OHE posters presentation, tour of dental hospital, oral examination once a year	No intervention	30-minute instruction for children bi-weekly for 3 years 30-minute instruction for mothers once a year	Plaque index Sulcular bleeding index Questionnaire
	Esfahanizadeh 2011 Iran	cRCT	N=160 6–7-year-olds	Parents and dentists	OHE using brochures, catalogues, poems, stories, models.	Toothpaste and toothbrush	30 minutes Follow-up at 6 months	Plaque index Gingival Index Excluded as secondary outcome only
	Haleem 2012 Pakistan	cRCT	N=1657 6-year-olds	Dentist, teachers and peer leaders	OHE based on the contents of a booklet supplemented by a set of seven pre-tested posters tooth brushing demonstration using models question-answer session group activities	Self-learning group: OHE booklets Control group: No intervention	1 hour Follow-up at 2 years	Questionnaire

Parameter	Extraction items							
	Angelopoulou 2015 Greece	NRCT	N=274 10–11-year- olds	School teachers	Experiential learning with teacher Working groups and specific oral health projects, classroom presentations, play, posters, songs, crafts, role playing. Dentist demonstrated oral hygiene practices	Traditional Learning with lectures from dentist	Follow-up at 2.6 years	Questionnaire Gingival index
	Karim 2016 Iraq	NRCT	N=60 10-year- olds	Dentist	OHE with lectures, demonstration with models, group discussions	No intervention	1.5 hours/day Follow-up at 1.2 years	Questionnaire
	Lai 2016 Taiwan	NRCT	N=240 11–12-year- olds	School dental nurses	Oral hygiene instructions on flossing, brushing techniques. Supervised tooth brushing	No intervention	Daily during school days, for one semester. Follow-up at 10 years	Questionnaire Plaque index Community periodontal index
	Naidu 2017 India	NRCT	N=926 6–8-year- olds and 9– 12-year- olds	School teachers	Dental health lesson using flip charts and models for brushing demonstration (study materials age related)	No intervention	Once every 2 weeks Follow-up at 6 months	Questionnaire Gingival Index Plaque index

OHE: oral health education

Parameter	Extraction items
Setting/context	<p>Countries (no. studies) (in alphabetic order):</p> <p>Belgium (1 study) Brazil (2 studies excluded) China (1 study) China (2 studies excluded) England (1 study) Finland (1 study) Greece (1 study) India (1 study) Iran (1 study excluded) Iraq (1 study) Jordan (1 study excluded) Pakistan (1 study) Taiwan (1 study) United Kingdom (1 study) United States (1 study) Zimbabwe (1 study excluded).</p> <p>Setting (no. studies): e.g. all studies were school-based</p> <p>Other relevant features: Providers - The common health educators were dentists, postgraduate students, schoolteachers, parents, and dental facilitators such as the school dental hygienist or nurse and peers in school.</p>
Databases and sources searched	<p>Protocol prepared: No information</p> <ul style="list-style-type: none"> If published, number and link: <p>Number and names of databases: 6 databases searched PubMed, IndMED, MEDLINE, Web of science, Cochrane database, EMBASE,</p> <p>Other non-database sources: Sources included hand search and cross-references in the selected articles that fit the eligibility criteria.</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> Grey literature search: Yes. Google Scholar, and Grey literature Reference chasing: Yes, hand search and cross-references in the selected articles Expert consultation: No information <p>Search strategy/key words provided: Yes.</p> <p>Time period covered by searches: no information provided</p> <p>Search limits (e.g. date, language): limited to articles published in English</p> <ul style="list-style-type: none"> Are search limits justified/appropriate? No information provided

Parameter	Extraction items
	<p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported. A third author settled any inconsistencies between the two reviews. <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported. A third author settled any inconsistencies between the two reviews. <p>Funding of review: Review authors reported they received no financial support and sponsorship</p> <p>Conflicts of interest declared: Review authors reported there are no conflicts of interest</p> <p>If declared, how conflicts of interest were managed:</p> <p>Date range for included studies relevant to this overview of reviews: 1982 to 2017</p>
Date Range (years) of included studies	<p>Exact years of publication of studies relevant to this overview of reviews: 1982 (1 study), 1999 (1 study), 2001 (1study), 2004 (1 study), 2009 (2 studies), 2012 (1 study), 2015 (1 study), 2016 (2 studies), 2017 (1 study)</p> <p>Excluded 2001 (1 studies), 2004 (3 studies), 2006 (1 study), 2007 (1 study),</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 11/18 studies were included in the systematic review</p> <p>Number of studies by study design: 5/6 RCTs (2/3 cluster, 1 crossover, 1 block, 1 individual), 6/12 NRCTs</p> <p>Funding of primary studies: No information provided</p> <p>Conflicts of interest of primary studies: No information provided</p>
Types of studies included	<p>Planned study design(s) to be included: not specified other than intervention studies</p> <p>Reasons for including study design(s) provided? No information provided</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No information provided</p> <p>Reasons for exclusion provided? No</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane risk of bias assessment tools. ROB2 and ROBINS-I</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Confounding: Yes

Parameter	Extraction items
Appraisal ratings	<ul style="list-style-type: none"> • Selection bias: Yes • Exposure and outcomes: Yes • Selective reporting: Yes <p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>Of the six RCTs review authors assessed High risk of bias (low quality) (k=0), unclear/moderate risk of bias (unclear/moderate quality) (k=3), low risk of bias (high quality) (k=3)</p> <p>Of the 12 NRCTs review authors assessed High risk of bias (low quality) (k=1), unclear/moderate risk of bias (unclear/moderate quality) (k=2), low risk of bias (high quality) (k=9)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): Review authors cautioned on the results of one study (Frencken 2001) as it had a high risk of bias due to reshuffling of children during the study. This study was not included in the current synthesis as no primary outcomes were included. Review authors noted that "Irrespective of the risk of bias, among the 18 studies, nine of them have shown a positive outcome in the parameters they assessed."</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No meta-analysis conducted • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Limited discussion on impact of risk of bias. Review authors specified the outcome of one study (Frencken 2001) could not be considered as it had a high risk of bias due to reshuffling of children in the middle of the study. <p>Assessment of publication bias: Not reported</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
	Method of analysis

Parameter	Extraction items
	<ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: No meta-analysis conducted • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Not applicable <p>For prospective cohort studies: N/A</p>
Outcomes assessed	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Changes in the [knowledge, attitude,] and practice behavior of children following school dental health education interventions
Results/findings	<p><u>META-ANALYSIS FINDINGS</u> No meta-analysis conducted</p> <p>Primary outcomes</p> <p><u>NARRATIVE SYNTHESIS</u></p> <ul style="list-style-type: none"> • Primary outcomes: Changes in the knowledge, attitude, and practice behavior of children following school dental health education interventions <p>Questionnaires and indices were used by various authors to assess the outcomes of OHE provided. Eleven authors used questionnaires to assess the oral health-related knowledge, attitude, and practice behavior. These outcomes were presented in tabulated format based on the study design and level of evidence.</p> <p>The outcomes of interest of the current overview of reviews are the practice behaviours reported:</p> <p>Toothbrushing/flossing</p> <p>One study [Redmond 1999] showed that school-based dental health education program in adolescents, increased their duration of toothbrushing (73% - 89%). Another study [Tai 2009] showed significant improvement in the percentage of children who brushed twice daily (31.6%) and used fluoridate toothpaste (16.2%), while Tolvanen 2009 showed increased tooth brushing with fluoride toothpaste twice a day (49%-64%). Karim 2016 showed significant improvement in the oral health educational group with the practice of cleaning teeth regularly with toothbrush and fluoridated toothpaste (no effect measurement reported). The Naidu 2017 study showed toothbrushing twice daily increased to 94.9% and 97.84% in younger and older children respectively. Supervised oral hygiene and provision of instruction [Lai 2016] showed habits like flossing were significantly better in the intervention group (no effect measurement reported).</p> <p>General oral health behaviour</p> <p>One study [Angelopoulou 2015] showed that the behavior and attitudes acquired through experiential learning with schoolteachers improved at 6 months and declined at 18 months while knowledge was maintained (no effect measurement reported). In the</p>

Parameter	Extraction items
	<p>Haleem 2012 study whether OHE was provided by dentists, schoolteachers or peer-led oral health behaviours improved across all groups. Peer-led group showed 37.5% change in mean oral health behaviours score.</p> <p>Dietary habits One oral health education programme [Tolvanen 2009] reported reduced eating candies in the intervention group (74% - 86%). Another [Redmond 199] found an improvement in the frequency of sugar intake and dental caries (16% - 66%), similarly following OHE with lectures on dietary habits [Vanobbergen 2004] the intervention group lowered the frequency of between-meal snacks (31.3% - 29.9%).</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes</p>
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Causes of heterogeneity investigated? Not investigated but authors commented on the various providers, techniques and resources used "In the articles reviewed, the interventions and the outcomes varied to a great extent."(page 445)</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	

Salazar *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	Salazar <i>et al.</i> (2024)
Review title	Effect of oral health interventions for dependent older people—A systematic review
Review coding	Older people; Mixed providers.
Contributing primary studies	The information presented in this extraction form applies only to the 17/30 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (studies assessing mechanical interventions (n=4 studies [Blahut 1993, Fjeld 2014, Lavigne 2017, Yonezawa 2003]), chemical interventions (n=7 studies [Ekstrand 2008, 2013, Clavero

Parameter	Extraction items
Objectives	<p>2003, Chalhoub 2016, Wyatt 2004, Simon 2001, Tan 2010)), combined mechanical/chemical interventions (n=1 study [Quagliarello 2009]) and professional care (n=1 [Morino 2014]) are not included)</p> <p>Review research question(s) and/or objectives (including page number(s)): Review authors aimed to make a comprehensive assessment of all the available evidence describing interventions to improve oral health, ensure adherence to the oral health care system or both for dependent older adults. (page 201)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: adults >65 years old, defined as frail, partially or completely dependent, who were community-dwelling (CDOP), or residents of any long-term care facility (LTCF), regardless of their mental or physical status. • Intervention: any type of intervention to promote and improve oral health in older people, such as (but not limited to) education or training of the caregivers, nursing staff or the residents themselves. any type of intervention aiming to guarantee access or improve adherence to oral healthcare, such as (but not limited to) implementing regular dental professional or dental hygienist visits. • Comparison: usual care or when no intervention was provided, and comparisons between interventions. • Outcome: Primary <ul style="list-style-type: none"> a. Oral health-related quality of life (OHRQoL): measured with validated scales. <ul style="list-style-type: none"> ○ b. Oral and dental health: evaluated with standardised indicators ○ c. Use of the oral health care system • Setting: Community-dwelling or long-term care facility • Study design: RCTs • Timeframe for follow-up: Not specified
Participants	<p>Number of participants: The number of included participants in individual primary studies ranged from 16 to 369.</p> <p>Age (mean/mode/range): not reported in 1 study, mean age ranged from 64.7 to 88.9 in included studies, 1 study reported median age as 87 (control) 82 (intervention)</p> <p>Gender: not reported in 1 study, % female participants ranged from 40% - 78% in included studies</p> <p>Details of any additional relevant participant characteristics:</p> <p>Most studies reported follow-ups of 6 months or less (n=13 studies), and only four studies had follow-ups of more than one year.</p>
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p>

Overview of relevant characteristics of primary studies included in systematic review:

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Girestam Croonquist 2020 Sweden ROB Low	cRCT 9 Nursing homes	N=146 Residents with at least 10 teeth	dental hygienists	Supervised oral hygiene instruction, verbally and in writing, monthly review Face-to-face for caregivers & residents	Oral hygiene instruction then unsupervised usual care	Baseline, monthly for 6 months 6-month follow-up	Dental Plaque Root Caries Mucosal Score
De Visschere 2011 Belgium ROB some concerns	cRCT 14 Nursing homes	N=253 residents	Investigator	Supervised oral health education; individualised oral health plan Face-to-face for caregivers & oral health coordinator	Usual care	Single baseline session 5-year follow-up	Dental Plaque Denture Plaque
De Visschere 2012 Belgium ROB Low	cRCT 12 Nursing homes	N=373 residents with natural dentition and/or dentures	Dental hygienist, investigators and oral health care team	Supervised implementation of oral health guideline Face-to-face for caregivers	No supervised implementation	Baseline, 6, 12 & 24 weeks, 6-month follow-up	Dental Plaque Denture Plaque Tongue coating index
Frenkel 2001 UK ROB Low	cRCT 22 Nursing homes	N=412 residents with dentures	Health Promotor	Oral health education with teaching aids,	Usual care	Single 1 hour baseline session	Dental Plaque Denture Plaque

Parameter	Extraction items							
			and/or natural teeth		demos and practice of techniques Face-to-face for caregivers		6-month follow-up	Gingivitis Stomatitis
Jablonski 2018 US ROB some concerns	RCT 9 Nursing homes	N=101 Residents with at least 2 adjacent teeth and/or dentures	Mouth-care providers trained by MOUTH intervention	Managing Oral Hygiene Using Threat Reduction (MOUTH) intervention Face-to-face for residents	Usual mouth care	Twice daily for 3 weeks 3-week follow-up	Overall oral health assessment	
Khanagar 2015 India ROB some concerns	cRCT 7 Older people homes	N=322 Residents with 10+ natural teeth or dentures	Dental professional	Oral health education Face-to-face PowerPoint presentation, computer and manual (self-learning) for caregivers	Usual care	Baseline 6-month follow-up	Dental Plaque Denture Plaque Gingivitis	
Le 2012 Canada ROB some concerns	cRCT 5 Nursing homes	N=not reported Residents with natural teeth	Investigators	Oral health education with oral care video Face-to-face and video for caregivers	Usual care	Baseline 6-month follow-up	Dental Plaque Gingivitis	
Li 2018 China ROB some concerns	cRCT 5 Nursing homes	N=348 Residents with at least 2 teeth in	Stomatologist or oral specialist nurse	Oral health education, hygiene instruction and demonstration,	Usual care	Baseline 1 hour lecture 6-month follow-up	OHRQoL Dental Plaque Gingivitis	

Parameter	Extraction items							
			each segment of the oral cavity		dental products supply Face-to-face for caregivers & residents			
MacEntee 2007 Canada ROB Low	cRCT 14 Long term care facilities	N=127 Residents who had natural teeth	Dental hygienist and nurse educator vs Dental hygienist	1-hour oral health information session, demos/texts/photos with care-aides + additional guidance and telephone support from dental hygienist	1-hour oral health information session, demos/texts/photos with care-aides	Baseline and constant for 3 months 3-month follow-up	Dental Plaque Gingivitis Nutritional Status	
Marchini 2018 US ROB some concerns	cRCT 8 Nursing homes	N=81 All residents invited	Dental hygienist	Oral health education supervised every 2 nd week. 1 hour tailored lecture for staff, oral hygiene instruction and reinforcement Face-to-face for caregivers & residents	Usual care	Baseline, every other week for 6 months 6-month follow-up	Dental Plaque Gingivitis Nutritional Status	
Mojon 1998 Switzerland ROB some concerns	cRCT 1 Long term care facility, 12 wards	N=116 Residents with at least 2 natural teeth	Dental hygienist	Oral health education Slide presentation, dental products & practical Face-to-face for caregivers & residents	Usual care	Baseline 18-months follow-up	Dental Plaque Root Caries Coronal Caries	

Parameter	Extraction items							
	Overgaard 2021 Denmark ROB some concerns	cRCT 14 Nursing homes	N=243 Resident with at least one natural tooth	Project dentist and dental practitioner	Supervised oral health education for caregivers & residents with instructions and adjustments	Usual care	monthly for 6 months 1-year follow-up	Dental plaque
	Van der putten 2013 Netherlands ROB some concerns	cRCT 12 Care homes	N=343 Residents with teeth and/or dentures	Dental hygienist, investigators and oral health care team	Supervised implementation of oral health guideline & daily protocol Face-to-face for caregivers	Usual care	Baseline, 6, 12, 24 weeks 6-month follow-up	Dental Plaque Denture Plaque
	Weintraub 2018 US ROB some concerns	cRCT 14 Nursing homes	N=219 Residents with natural teeth or using a denture	Dementia specialist/dental hygienist	Oral health education, mouth care, techniques, products Face-to-face for caregivers	Usual care	Baseline, monthly for 2 years 2-year follow-up	Dental Plaque Gingivitis Denture Plaque
	Yu 2016 China ROB Low	RCT Community-dwelling	N=150 Care recipients with a history of stroke and at least 20 teeth	Dental hygienist	Oral health education (supervised or unsupervised) Hands on oral hygiene instruction, oral hygiene video Face-to-face for caregivers & participants	Limited oral hygiene instruction	Baseline, monthly for 3 months 3-month follow-up	Dental Plaque Gingivitis

Parameter	Extraction items							
Zenthofer 2013 Germany ROB Low	RCT 8 Long term care facilities	N=102 Residents	Dentist and Dentist/caregiver	Oral health education (unsupervised, supervised weekly, supervised monthly) PowerPoint presentation, brochures, dental products Face-to-face for caregivers & residents	Usual care	Baseline, weekly up to 3 months or Baseline, at 4, 8, 12 weeks 3-month follow-up	Dental Plaque Gingivitis Denture Plaque	
Zenthofer 2016 Germany ROB Low	cRCT 14 Nursing homes	N=219 Residents with natural remaining teeth and/or dentures	Dentist/dental personnel	Oral health education Two-day comprehensive education program, PowerPoint presentation, demonstration, CD-ROM and print Face-to-face computer movie for caregivers and residents	Usual care	Baseline 6-month follow-up	Dental Plaque Gingivitis Denture Plaque	

Countries (no. studies) (in alphabetic order): Most studies were conducted in Europe (n=9), then North America (n=5), Asia (n=3)

Setting/context

Belgium (2 studies), Canada (2 studies), China (2 studies), Denmark (1 study), Germany (2 studies), India (1 study), Netherlands (1 study), Sweden (1 study), Switzerland (1 study), United Kingdom (1 study), United States (3 studies)

Parameter	Extraction items
Databases and sources searched	<p>Setting (no. studies): Community-dwelling (1 study), long-term care facility (16 studies)</p> <p>Other relevant features:</p> <p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> If published, number and link: PROSPERO ID: CRD42021231721. <p>Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD42021231721</p> <p>Number and names of databases: Searches performed in 3 databases MEDLINE (access via PubMed), EMBASE (access via OVID) and CENTRAL (the Cochrane Central Register of Controlled Trials)</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches: Clinical trials databases also searched</p> <ul style="list-style-type: none"> Grey literature search: Yes Google Scholar searched Reference chasing: Yes Expert consultation: No <p>Search strategy/key words provided: Yes. Search strategy provided in appendix 1</p> <p>Time period covered by searches: from inception to December 2020, and updated search on 11 October 2022.</p> <p>Search limits (e.g. date, language): No language or publication date restrictions applied</p> <ul style="list-style-type: none"> Are search limits justified/appropriate? Not applicable <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> If yes, rate of agreement: Disagreements in both stages were solved by consensus or with a third author. <p>Extraction completed in duplicate: No. One reviewer extracted the data using a previously piloted data extraction sheet, and a second reviewer cross-checked this process.</p> <ul style="list-style-type: none"> If yes, rate of agreement: <p>Funding of review: No information provided</p> <p>Conflicts of interest declared: The authors declared they had no competing interest to disclose.</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: Studies published between 1998 and 2021</p> <p>Exact years of publication of studies relevant to this overview of reviews: 1998 (1 study), 2001 (1 study), 2007 (1 study), 2011 (1 study), 2012 (2 studies), 2013 (2 studies), 2015 (1 study), 2016 (2 studies), 2018 (4 studies), 2020 (1 study), 2021 (1 study)</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: The current synthesis includes 17 of the 30 RCTs included in the systematic review</p>

Parameter	Extraction items
	<p>Number of studies by study design: Individual RCTs (n=3 studies); Cluster RCTs (n=14)</p> <p>Funding of primary studies: The authors of 10/17 included studies reported funding – Public agencies (n=8); Private (n=1); Mix of public and private funding (n=1)</p> <p>Conflicts of interest of primary studies: The authors of 8 included studies reported on potential conflicts of interest</p> <p>Planned study design(s) to be included: Review authors planned to include randomised clinical trials (RCTs), cluster RCTs and non-randomised controlled trials (nonRCTs) that assessed the efficacy of oral health interventions in dependant older people.</p>
Types of studies included	<p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? Yes. List provided in appendix 2</p> <p>Reasons for exclusion provided? Yes. Listed in appendix 2</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane Collaboration Risk of Bias Tool ROB2 evaluated all domains</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: not applicable</p> <ul style="list-style-type: none"> • Confounding: Yes/No • Selection bias: Yes/No • Exposure and outcomes: Yes/No • Selective reporting: Yes/No <p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p>
Appraisal ratings	<p>High risk of bias (low quality) (k=0)</p> <p>Unclear/moderate risk of bias (unclear/moderate quality) (k=10)</p> <p>Low risk of bias (high quality) (k=7)</p>

Parameter	Extraction items
	<p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No – Studies with low ROB and studies with some concerns included in meta-analysis • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No. Review authors noted that concerns about risk of bias in the included studies impacted on the certainty of evidence assessment and contributed to this being assessed as low or very low. <p>Assessment of publication bias: No information provided</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
<p>Method of analysis</p>	<p>Authors description of method of analysis (include page number): Review authors grouped studies according to the intervention and investigated each comparison separately in the review. Authors analysed dichotomous outcomes with risk ratios (RR) and continuous outcomes with mean difference (MD) or standardised mean differences (SMD) when studies used different scales to assess the same outcome, along with their respective 95% confidence intervals. A narrative description of findings presented. (page 202)</p> <p>Authors' justification for narrative synthesis or meta-analysis: When there was more than one study in comparison, authors considered the studies to be reasonably clinically and methodologically homogeneous, pooled the data using a random effect model for meta-analysis.</p> <p>If meta-analysis was conducted, authors' justification for combining data in meta-analysis: When there were individual and cluster RCTs for the same outcome, authors estimated an "effective sample size" in cluster RCTs to analyse them together.</p> <p>Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes Authors assessed clinical heterogeneity by examining the characteristics of participants, interventions and comparisons and statistical heterogeneity of the included studies with I^2. They followed the Cochrane Handbook recommendations to interpret it, with an I^2 greater than 50% representing substantial heterogeneity and greater than 75% representing considerable heterogeneity. Authors considered the heterogeneity assessment for purposes of the estimation of certainty of evidence.</p> <p>For prospective cohort studies: Not applicable</p>

Parameter	Extraction items
Outcomes assessed	<p>Effects of oral health education (OHE) intervention outcomes separately reported by Community-dwelling older people and Long-term care facilities</p> <p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Oral health-related quality of life (OHRQoL): measured with validated scales. • Primary outcome 2: Oral and dental health: evaluated with standardised indicators • Primary outcome 3: Use of the oral health care system – Review authors did not find any studies that assessed or adequately reported changes in the use of the dental care system <p>List of authors' secondary outcomes: not applicable</p>

Results/findings	META-ANALYSIS FINDINGS								
	Long-term care facilities								
	<p>Authors reported it was possible to conduct a meta-analysis using a random effects model for dental plaque, gingival index and denture plaque. Thirteen studies reported measures of oral hygiene and authors grouped studies according to the two subgroups (supervised/unsupervised).</p> <p>Primary outcomes 2: Oral and dental health</p> <p>Dental plaque. Nine studies comparing OHE to usual care provided sufficient data for a meta-analysis for dental plaque. Combined analysis showed OHE may result in a reduction in dental plaque in the short-term (SMD -0.59 [-1.10, -0.09] I² 86%, p=0.08) Low certainty evidence</p> <p>Two studies also comparing OHE to usual care provided sufficient data for meta-analysis of results with a long-term follow-up (2–5 years).</p>								
	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
	Dental plaque Short-term	Unsupervised oral health education versus usual care	Dental plaque index scales 0–3; 0–5; 0%–100%	6 RCTs (n=392) (Frenkel 2001, Khanagar 2015, Le 2012, Li 2018, Zenthofer	SMD -1.04, (-1.92, -0.17)	0.02	93%	Unsupervised OHE may result in a reduction in dental plaque in the short-term (3–6 months follow-up)	

Parameter	Extraction items								
			Higher means worse	2013 (1), Zenthofer 2016))					
	Supervised oral health education versus usual care			4 RCTs (n=207) (De Visschere 2012, Marchini 2018 (1,2), Van der Putten 2013, Zenthofer 2013 (2,3))	SMD -0.22 (-0.51, 0.07)	0.14	0%	Supervised OHE may result in a reduction in dental plaque in the short-term (3–6 months follow-up) (non-significant)	
Dental plaque long-term	Unsupervised oral health education versus usual care	Dental plaque index scales 0–3; 0–5; 0%–		1 RCT (n=48) De Visschere 2011	MD 0.10 (0.32, 0.52)	0.64	N/A	Unsupervised OHE may result in little to no difference in dental plaque (2–5-year follow-up)	
	Supervised oral health education versus usual care	100% Higher means worse		1 RCT (n=116) Weintraub 2018	MD -0.41 (-0.54, -0.28)	<0.0001	N/A	Supervised OHE may result in a reduction in dental plaque (2–5-year follow-up)	

Gingivitis. Six studies comparing OHE to usual care provided sufficient data for a meta-analysis for gingivitis at short term 3 – 6 month follow-up. Combined analysis showed OHE may result in a reduction in gingival index scores in the short-term (SMD -0.38 [-0.59, -0.17] I² 0%, p=0.0003)

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
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Parameter		Extraction items						
Gingivitis	Unsupervised oral health education versus usual care	Gingival index Scales 0-2; 0-3; 0%-100% Higher means worse	5 RCTs (n=329) (Frenkel 2001, Le 2012, Li 2018, Zenthofer 2013 (1), Zenthofer 2016)	SMD -0.39 (-0.68, -0.11)	0.006	30%	Unsupervised OHE may result in less gingivitis in the short term (3–6 months follow-up)	
	Supervised oral health education versus usual care		2 RCTs (n=82) (Marchini 2018 (1,2), Zenthofer 2013 (2,3))	SMD -0.32 (-0.86, +0.21)	0.24	0%	Supervised OHE may result in little to no difference in gingival scores in the short term (3-6 months follow-up)	
Gingivitis	Supervised vs unsupervised oral health education	Gingival bleeding index 0%-100%	2 RCTs (n=149) Zenthofer 2016, MacEntee 2007	MD +1.29 (-3.86, +6.43)	Not reported		MD 1.29 higher (3.86 lower to 6.43 higher)	

Denture plaque. Seven studies comparing OHE to usual care provided sufficient data for a meta-analysis for denture plaque. Combined analysis showed OHE may result in a reduction in denture plaque in the short-term (SMD -1.20 [-1.83, -0.56] I² 92%, p=0.0002) Low certainty evidence

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Denture plaque	Unsupervised oral health education	Denture plaque index	4 RCTs (n=410) (Frenkel 2001,	SMD -1.85,	0.0006	93%	Unsupervised OHE may result in a reduction in denture plaque in the	

Parameter	Extraction items							
Short-term	versus usual care	Scales: 0-4; 0%-100% Higher means worse	Khanagar 2015, Zenthofer 2013 (1), Zenthofer 2016))	(-2.91, -0.80)				short-term (3–6 months follow-up)
	Supervised oral health education versus usual care		3 RCTs (n=284) (De Visschere 2012, Van der Putten 2013, Zenthofer 2013 (2,3))	SMD -0.45 (-0.69, -0.20)	0.0003	0%	Supervised OHE may result in a reduction in denture plaque in the short-term (3–6 months follow-up) (non-significant)	
Denture plaque long-term	Unsupervised oral health education versus usual care	Denture plaque index Scales: 0-4; 0%-100% Higher means worse	1 RCT (n=87) De Visschere 2011	MD -0.33 (-0.71, 0.05)	0.09	N/A	Unsupervised OHE may result in little to no difference in denture plaque (2-year follow-up)	
	Supervised oral health education versus usual care		1 RCT (n=41) Weintraub 2018	MD -0.95 (-1.47, -0.43)	0.0004	N/A	Supervised OHE may result in a reduction in denture plaque (2-year follow-up)	

NARRATIVE SYNTHESIS

Primary outcomes 1: Oral health-related quality of life. Long-term care facilities

Only one study reported OHRQoL and showed that OHE may result in a very slight improvement at 6-month follow-up compared to usual care.

Outcome	Intervention vs. comparator	Measure	Primary studies	Summary estimate	p-value	Results	Additional

Parameter	Extraction items						
			contributing to analysis			(Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	
OHRQoL	Oral health education versus usual care	Geriatric Oral Health Assessment Index (GOHAI) (Scale from 12 – 60, higher is better)	1 RCT (Li 2018) (n=78)	MD +3.99 (+0.49, +7.49)	N/A	Oral health related quality of life improved in the intervention group at 6 months compared to control where the mean GOHAI score was 34.49. Low certainty of evidence	

Primary outcomes 2: Dental plaque and gingivitis. Community-dwelling older people

One study found that supervised OHE may result in a slight reduction in dental plaque over unsupervised OHE after three months (Yu 2016).

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Dental plaque	Supervised vs unsupervised oral health education	Plaque index (scale from 0 – 3, higher means worse)	1 RCT (Yu 2016) (n=130)	MD -0.5 (-0.51, -0.48)	N/A	Dental plaque was lower in intervention group (MD 0.5 lower, 95% CI 0.51 lower to 0.48 lower) compared to control where plaque scores ranged from 2.31 to 2.32 (in control) Low certainty of evidence	
Gingivitis	Supervised vs unsupervised	Gingival index Scales	1 RCT (Yu 2016) (n=130)	MD -0.41 (-0.42, -0.39)	N/A	Gingivitis was lowered in intervention group compared to control where mean gingivitis	

Parameter	Extraction items						
	oral health education	(0-2; 0-3; 0%-100%) Higher means worse					ranged from 1.71 to 1.81 (in control) Moderate certainty of evidence

Primary outcomes 2: Gingivitis Long-term care facilities

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional
Gingivitis	Supervised vs unsupervised oral health education	Gingival bleeding index 0%-100% Higher means worse	2 RCTs (n=149) Zenthofer 2016, MacEntee 2007	MD +1.29 (-3.86, +6.43)	Not reported	Gingivitis scores were higher in the intervention group compared to control where mean gingivitis score was 8.5	

Stomatitis. Relative to usual care, review authors found OHE likely results in less stomatitis at 6-month follow-up in 2 studies n=383 (Frenkel 2001, Khanagar 2015) but may result in little to no difference in caries at 18-month follow-up (Mojon 1998). Frenkel 2001 reported that 12% of the participants in the OHE group presented stomatitis, compared to 34% in the usual care group. Khanagar 2015 reported that the scores in the OHE were significantly lower (representing better status) compared to usual care with a MD of -0.87 (95%CI -1.29, -0.45). Mojon 1998 (n=79) reported that there was no significant difference in the proportion of teeth with active root or coronal caries among the groups. OHE group: 15.3% and 7.53% of teeth had root and coronal caries, respectively, Usual care group: 18.14% and 5.9% had root and coronal caries, respectively.

Parameter	Extraction items
	<p>Dental caries. In the short-term, supervised compared to unsupervised OHE may result in little to no difference in new caries at 6 months, 1 RCT (Girestam Croonquist 2020) (n=124) reported no statistically significant difference between groups in the percentage of participants with new caries, with 31% in the supervised vs 27% in the unsupervised group.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable</p>
Heterogeneity	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Causes of heterogeneity investigated? Yes/No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	

Saxena *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	Saxena <i>et al.</i> (2024)
Review title	Maternal Oral Health Education for Predicting Early Childhood Caries among Preschool Children: A Systematic Review and Meta-analysis
Review coding	<p>Providers: Some unclear providers</p> <p>Participants: Maternal/early childhood</p>
Contributing primary studies	The information presented in this extraction form applies only to the 8/8 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “Can educational programmes on oral health for mothers effectively reduce the occurrence of ECC in their children?”</p> <p>“The purpose of this review is to bring together existing research findings regarding the efficacy of oral health education initiatives specifically designed for mothers to combat Early Childhood Caries (ECC) and determine which interventions have yielded the greatest success.” p42</p> <p>PICO elements reported in Introduction/Methods:</p>

Parameter	Extraction items																
	<ul style="list-style-type: none"> • Patient or population: Prenatal and postnatal mothers • Intervention: Educational programmes on oral health for mothers • Comparison: Not reported • Outcome: Early childhood caries (ECC) • Setting: Not reported • Study design: RCTs featuring at least one oral health educational intervention targeted at mothers • Timeframe for follow-up: Not reported 																
Participants	<p>Number of participants: Not reported. Totalled based on participant numbers reported for each of the included studies = 2591 participants</p> <p>Age (mean/mode/range): Not reported</p> <p>Gender: Female</p> <p>Details of any additional relevant participant characteristics: NA</p>																
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review:</p> <table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes</th> </tr> </thead> <tbody> <tr> <td>Chaffee (2015) Brazil</td> <td>Cluster randomised trial</td> <td>Control group: 221 Intervention group: 237 Pregnant women</td> <td>Health trainer nurses, physician, administrative staff</td> <td>Maternal education by health trainer nurses, physician, administrative staff through posters and templates</td> <td>Not reported</td> <td>Not reported Follow-up when child was 2-3 years old</td> <td>Early Childhood Caries (ECC), cavitated decay, Severe Early Childhood Caries (S-ECC) assessed</td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes	Chaffee (2015) Brazil	Cluster randomised trial	Control group: 221 Intervention group: 237 Pregnant women	Health trainer nurses, physician, administrative staff	Maternal education by health trainer nurses, physician, administrative staff through posters and templates	Not reported	Not reported Follow-up when child was 2-3 years old	Early Childhood Caries (ECC), cavitated decay, Severe Early Childhood Caries (S-ECC) assessed
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes										
Chaffee (2015) Brazil	Cluster randomised trial	Control group: 221 Intervention group: 237 Pregnant women	Health trainer nurses, physician, administrative staff	Maternal education by health trainer nurses, physician, administrative staff through posters and templates	Not reported	Not reported Follow-up when child was 2-3 years old	Early Childhood Caries (ECC), cavitated decay, Severe Early Childhood Caries (S-ECC) assessed										

Parameter	Extraction items							
								when child was 2-3 years old
Engh (2022) Uganda	RCT	Control group: 157 Intervention group: 200 Mothers of 6-8-month-olds	Nutrition education team	Maternal education by nutrition education team	Not reported	Not reported Assessed when child was 5-6 years old	Dental caries five to six-year old children	
Harrison (2012) Canada	Cluster randomised trial	Control group: 131 Intervention group: 110 Pregnant women	Community health representatives	Maternal education by community health representatives	Not reported	Not reported Assessed when child was 30-months old	Dental caries 30-month-old children	
Plutzer and Spencer (2008) Australia	RCT	Control group: 322 Intervention group: 327 Pregnant women	Not reported	Maternal education by three rounds of printed material applied as anticipatory guidance were given to the test group	Not reported	Not reported Assessed when child was 2-3 years old	Severe Early Childhood Caries (S-ECC) of two to three-year old children	
Feldens (2010) Brazil canaoas	Parallel RCT	500 mother-child pairs (200 intervention, 300 control) enrolled	Nutrition educators	Maternal education and oral hygiene promotion through nutrition	Not reported	Not reported Follow-up at 4 years	Severe Early Childhood Caries (S-ECC)	

Parameter	Extraction items							
			340 (141 intervention, 199 control) completed 4 year follow-up		educators given by home visits			
	Basir (2017) Iran	Parallel group design RCT experimental study was carried out through a parallel group design	The subjects were divided into two groups at random: the experimental group (n=52) and the control group (n=52). 52 people make up either the experimental group or the control group women with children aged 12-36 months old pregnant women	Not reported	Educational intervention (consisting of one individual session and a group (4–6 person) lasting for half an hour) was designed with the aid of women referring to the health center for monitoring their children's growth maternal education	Not reported	Not reported	Early Childhood Caries (ECC)
	Muhoozi (2018) Uganda	Cluster randomised trial	When the children were 36 months	Nutrition educators	Maternal education and oral hygiene	Not reported	Not reported	Early Childhood Caries (ECC)

Parameter	Extraction items							
			old, data were available from 399 mother/child pairs (78%) in the initial experiment (203 in the intervention group and 198 in the control group) women with children aged 12-36 months old pregnant women		promotion through Nutrition educators			
	Shenoy (2020) India	RCT	Control group: 156 Intervention group: 155 Pregnant women	Not reported	Maternal oral health education through verbal and pamphlet information	Not reported	Not reported	Early Childhood Caries (ECC)

Setting/context

Countries (no. studies) (in alphabetic order):

Australia – 1 study (Plutzer and Spencer (2008))

Parameter	Extraction items
	Brazil – 2 studies (Chaffee (2015), Feldens (2010)) Canada – 1 study (Harrison (2012)) India – 1 study (Shenoy (2020)) Iran – 1 study (Basir (2017)) Uganda – 2 studies (Engh (2022), Muhoozi (2018)) Setting (no. studies): Not reported Other relevant features: NA
Databases and sources searched	Protocol prepared: No <ul style="list-style-type: none"> • If published, number and link: NA Number and names of databases: 2 databases <ul style="list-style-type: none"> • Cochrane Oral Health Group’s Trial Register • PubMed Other non-database sources: <ul style="list-style-type: none"> • Google Scholar Details of any other supplementary searches: <ul style="list-style-type: none"> • Grey literature search: Yes • Reference chasing: Yes • Expert consultation: No Search strategy/key words provided: Yes Time period covered by searches: Not reported Search limits (e.g. date, language): Studies conducted in English <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes, reviews often limit studies to those conducted in English Screening completed in duplicate: Yes <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported Extraction completed in duplicate: Not reported <ul style="list-style-type: none"> • If yes, rate of agreement: NA Funding of review: None Conflicts of interest declared: None If declared, how conflicts of interest were managed: NA

Parameter	Extraction items
Date Range (years) of included	<p>Date range for included studies relevant to this overview of reviews: 2008-2022</p> <p>Exact years of publication of studies relevant to this overview of reviews:</p> <ul style="list-style-type: none"> • 2008 - 1 study (Plutzer and Spencer (2008)) • 2010 – 1 study (Feldens (2010)) • 2012 - 1 study (Harrison (2012)) • 2015 - 1 study (Chaffee (2015)) • 2017 - 1 study (Basir (2017)) • 2018 – 1 study (Muhoozi (2018)) • 2020 - 1 study (Shenoy (2020)) • 2022 – 1 study (Engh (2022))
Number of primary studies included in the systematic review	<p>Number of primary studies: 8</p> <p>Number of studies by study design:</p> <ul style="list-style-type: none"> • Cluster randomised trial – 3 studies (Chaffee (2015), Harrison (2012), Muhoozi (2018)) • RCT – 3 studies (Engh (2022), Plutzer (2008), Shenoy (2020)) • Parallel RCT – 2 studies (Feldens (2010), Basir (2017)) <p>Funding of primary studies: No</p> <p>Conflicts of interest of primary studies: Yes</p> <p>Planned study design(s) to be included: RCTs</p>
Types of studies included	<p>Reasons for including study design(s) provided? Yes</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): To rigorously evaluate the effectiveness of preventive interventions, a systematic review incorporating RCT is considered the most robust method. <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Reported “the risk assessment tool provided by the Cochrane Collaboration”</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes

Parameter	Extraction items
Appraisal ratings	<ul style="list-style-type: none"> • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: NA</p>
	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors provided an overall assessment of risk of bias for each trial. The HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, two of the included trials appeared to have high risk of bias (Plutzer 2007; Shenoy 2020).</p> <ul style="list-style-type: none"> • High risk of bias (low quality) (k=2) - Shenoy (2020), Plutzer (2008) • Unclear/moderate risk of bias (unclear/moderate quality) (k=1) - Muhoozi (2018) • Low risk of bias (high quality) (k=5) - Chaffee (2015), Engh (2022), Harrison (2012), Feldens (2010), Basir (2017) <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <p>Not explicitly</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No <p>They do not specifically discuss how including studies with unclear/moderate risk of bias may have impacted their results or certainty of evidence. The GRADE assessment rated risk of bias as "Not serious" (p46) without explaining why studies with unclear/moderate risk didn't affect this rating.</p> <p>Assessment of publication bias: Yes</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Funnel plot analysis • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): <ul style="list-style-type: none"> ○ Page 45-46: The authors note that the funnel plot "appears symmetrical and inverted" with "95% of studies lying within the CI" ○ Page 46: "Funnel plot asymmetry is minimal, with only two outliers among the 08 studies, indicating a low likelihood of significant bias"

Parameter	Extraction items
	<ul style="list-style-type: none"> ○ Page 45: For individual studies, they noted "an asymmetric funnel plot, suggesting potential publication bias or study heterogeneity" for the Uganda study (Engh et al.), while other studies showed either symmetry or asymmetry in the funnel plot ○ Page 46: "The plot suggests an absence of both bias and heterogeneity" <p>The authors concluded there was minimal publication bias based on the relatively symmetrical funnel plot with most studies falling within confidence intervals.</p>
Method of analysis	<p>Authors description of method of analysis (include page number):</p> <p>"Data analysis utilised the Review Manager [7] (RevMan) software from the Cochrane Collaboration. For dichotomous outcomes, the Risk Ratio (RR) was employed, and results were presented with their corresponding 95% Confidence Intervals (CIs). To evaluate heterogeneity, the researchers visually examined the Forest plot and calculated the I2 statistic, which measures the extent of variability among the studies. I2 values of 25%, 50%, and 75% indicate low, moderate, and high levels of heterogeneity, respectively. The GRADE system was used to assign grades to the evidence [8]." p43</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> ● If meta-analysis was conducted, authors' justification for combining data in meta-analysis: Not reported ● Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? <ul style="list-style-type: none"> ○ Yes for weighting technique (p43): "The Mantel-Haenszel method was used to calculate the OR's 95% CI" ○ No for heterogeneity adjustment (p45): Despite finding 62% heterogeneity (which indicates moderate to high heterogeneity), the authors used a fixed-effect model rather than a random-effects model: "In the current review, a fixed-effect model was employed to construct a forest plot based on the premise that the true effect size remained constant throughout all the studies under consideration." <p>For prospective cohort studies: NA</p> <ul style="list-style-type: none"> ● Statistical combination of data adjusted for confounding (not raw data): Yes/No ● Authors' justification for combination of raw data where adjusted estimates were not available (include page number): ● Summary effect estimates reported separately for RCTs and prospective cohort studies: Yes/No
Outcomes assessed	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> ● Primary outcome 1: Dental caries

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
	Dental caries	Maternal education vs control	Varied – Some studies reported Early Childhood Caries (ECC), some Severe Early Childhood Caries (S-ECC) and others did not report a measure.	8 studies - Chaffee (2015), Harrison (2012), Muhoozi (2018), Engh (2022), Plutzer (2008), Shenoy (2020), Feldens (2010), Basir (2017)	OR 1.77 (95% CI 1.47-2.13)	p<0.00001	62%	n=1297 (experimental) n=1294 (control) A total of 1294 pregnant/post-natal women who served as controls were compared with 1297 pregnant/post-natal2 women in the intervention group. The results of the analysis showed that controls had higher chances of dental caries occurrence, which were significant at p<0.00001 and 1.77 (95% CI; 1.47-2.13) . This suggests that maternal education plays a key role in reducing the risk of dental caries. The above analysis showed a heterogeneity of 62% .	

Parameter	Extraction items									
									This could be associated with methodological differences such as the modes of delivering health education, socio-economic status of the mothers, and different methods of caries assessment performed in the studies.	
<p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes/No</p>										

Heterogeneity

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

- "The above analysis showed a heterogeneity of 62%. This could be associated with methodological differences such as the modes of delivering health education, socio-economic status of the mothers, and different methods of caries assessment performed in the studies." p45
- In limitations, they note "The limited number of included studies and heterogeneity restricted the use of robust meta-analysis techniques, potentially affecting the precision of the estimated effect." p47

Causes of heterogeneity investigated? No

- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**
- **If yes, provide a brief indication of the extent of heterogeneity in the relevant results:**

Comments

Shakir *et al.* (2021) – Extraction form

Parameter	Extraction items
First author and year of publication	Shakir <i>et al.</i> (2021)

Parameter	Extraction items
Review title	Effectiveness of school-based behavioural interventions to improve children’s oral health by reducing sugar intake and promoting oral hygiene: A rapid review of randomised controlled trials.
Review coding	School-based; Some providers unclear
Contributing primary studies	The information presented in this extraction form applies to all 8/8 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “The present rapid review aimed to review randomised controlled trials (RCTs) that evaluated the effectiveness of school-based behavioural interventions (with or without environmental elements such as daily supervised toothbrushing) in improving children’s oral health.” p276</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: children aged 3 to 18 years, of both sexes, from any socio-demographic and ethnic backgrounds, with different baseline levels of dental caries and fluoride exposure, • Intervention: behavioural interventions that targeted child oral health behaviours related to both sugar intake and oral hygiene (including toothbrushing with fluoride toothpaste, use of fluoride mouthrinse and/or dental flossing). The intervention could include environmental elements (e.g. daily supervised toothbrushing, healthier school lunches, more water fountains, removing vending machines). It could include multiple methods of delivery and other components that may also occur within the home and/or a clinical setting (e.g. school trips to the dentist to expand on the related learning experience). • Comparison: usual health education; that is, the standard health-based education from their current school curriculum. • Outcome: improved oral health in relation to caries, plaque scores, gingival health, frequency or amount of sugar intake • Setting: attending primary or secondary schools. • Study design: RCTs • Timeframe for follow-up: one month or more
Participants	<p>Number of participants: : not reported. Totalled based on participant numbers reported for each of the 8 included studies: ranged from 1331 to 135 participants across each study, total: 5225 participants. Dropouts reported per study ranged from 0 – 114, total: 246 dropouts.</p> <p>Age (mean/mode/range): not specifically reported</p> <p>Gender: not reported</p> <p>Details of any additional relevant participant characteristics:</p>
Description of Interventions/ phenomena of interest	Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers)

Parameter	Extraction items						
	<p>and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review: None of the studies reported on oral health-related quality of life.</p> <p>All included studies were cluster RCTs.</p>						
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Haleem 2012 Pakistan	cRCT	N=1,331 children (aged 10-11 years) n=1007 intervention n=324 control	Trained dentists, teachers or peers.	Education was based on a booklet, seven pretested posters and an oral hygiene demonstration.	No intervention	After six months oral health education messages were repeated and reinforced monthly for six months. Follow-up at 2 years	Oral hygiene status
Naseri-Salahshour 2019 Iran	cRCT	N=516 elementary school children in the fourth, fifth and sixth grades n=258 intervention n=258 control	Unclear who provided the intervention as school health coaches provided standard training in control group	Theory of planned behaviour-based intervention. 3 sessions raised students' awareness, role-play and	Standard training provided by school health coaches.	45-minute lectures and group discussions three times a week Follow-up at 1 month	Behaviour related to diet

Parameter	Extraction items							
					practical work to enhance behavioural control, demonstrated toothbrushing and flossing. Booklet on dental work, use of toothbrushes and floss, causes of dental caries and harmful foods for the teeth.			
	Qadri 2018 Germany	cRCT	N=854 children (aged 9-12 years) n=336 intervention n=404 control	Schoolteachers	Intervention based on health literacy and oral health competence using personal, cognitive and social skills, included topics on oral health, healthy nutrition,	No intervention until after the end of the study	Integrated into general health promotion curriculum Follow-up at 19 months	Dental caries
	Saied-Moallemi 2009 Iran	cRCT	N=457 children (aged 9 years) n=240 intervention n=117 control	Unclear who provided the intervention. Parents	3 Groups: Group 1 had 3-4 sessions over one month	No intervention	Follow-up at 3 months	Plaque levels and gingival health.

Parameter	Extraction items							
				provided the intervention for group 2	lasting 30-45 minutes to solve puzzles with messages on toothbrushing, with demonstrations and motivational posters on avoiding sugary snacks. Group 2 intervention provided via parents included an oral health leaflet and a brushing diary for supervision. Group 3 received both interventions			
Chachra 2011 India	cRCT	N=972 children (aged 5-16 years) intervention/control numbers not provided	Group 1: dentists Group 2: teachers Group 3: community organisations members	Educational albums, short stories and lectures on oral health and the relationship of sugar with caries,	No intervention	every 15 days over 6 months Follow-up at 6 months	Dental caries	

Parameter	Extraction items							
				trained by dentists	toothbrushing demonstrations and fluoride mouth rinse use. Educational materials were tailored to 5-9 - and 10-16-year-olds.			
	Anttonen 2010 Finland	cRCT	N=510 7th grade adolescent children n=151 intervention n=359 control	Unclear who provided (dental hygienist)	Dietary intervention took advantage of Finland's free school meals, encouraged the reduction of sugar consumption and increased intake of healthier foods, as well as the use of xylitol products after meals. Additionally, this group received oral hygiene instruction	No intervention	Follow-up at 1 year	Dietary habits Enamel mineralisation

Parameter	Extraction items							
	Vangipuram 2016 India	cRCT	N=450 adolescents (aged 12-15 years) n=300 intervention n=150 control	Group 1 5 children trained by dentist to deliver programme Group 2 dentist delivered	20-minute oral health education session using presentations, models, and other interactive learning methods.	No intervention	Follow-up at 3 and 6 months	Plaque levels Gingival health Oral hygiene practices
	Yang 2009 Taiwan	cRCT	N=135 Aboriginal adolescents n=67 intervention n=68 control	Unclear who provided (investigators)	Lectures, role play, small group discussion and group contests. Topics included understanding teeth and mouth, common diseases, healthy teeth and daily life, and damage from substance abuse.	No intervention	weekly 40- minute modules over eight weeks Follow-up at 2 months	Frequency of sweet consumption and toothbrushing

Countries (no. studies) (in alphabetic order): Finland (1 study), Germany (1 study), India (2 studies), Iran (2 studies), Pakistan (1 study), Taiwan (1 study)

Setting/context

Setting (no. studies): Schools were the focal site for intervention delivery

Other relevant features:

Parameter	Extraction items
Databases and sources searched	<p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> • If published, number and link: registered at PROSPERO platform (CRD42019148407) Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD42019148407 <p>Number and names of databases: 7 databases were searched – MEDLINE via Ovid, EMBASE, The Cochrane Library (Cochrane Central Register of Controlled Trials (CENTRAL)), Web of Science, PsycINFO via Ovid, ClinicalTrials.gov, The WHO International Clinical Trials registry Platform</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes • Reference chasing: Yes • Expert consultation: Yes <p>Search strategy/key words provided: Review authors reported that the search strategies for different databases combined keywords with medical subject headings (MeSH) terms related to school-based behavioural interventions as well as database-specific filters for controlled trials. (Available at https://qmro.qmul.ac.uk/xmlui/handle/123456789/72844) however link not working but located in QMUL repository.</p> <p>Time period covered by searches: Only trials conducted from 2000 onwards, January 2000 through December 2020</p> <p>Search limits (e.g. date, language): Published or reported in English</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes. Trials published before this date were deemed dated due to multiple changes in the curricula for schools, policy and school environments nationally and internationally. Also, limitation was to achieve rapidity of the review. <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: No rate reported. Disagreements between the reviewers were resolved through discussion with the arbiter. <p>Extraction completed in duplicate: Yes extracted independently by 3 reviewers, without blinding, using a piloted standardised form.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: No rate reported. Disagreements were resolved through discussion. <p>Funding of review: authors reported the review was not funded</p> <p>Conflicts of interest declared: All authors declared no conflict of interest.</p> <p>If declared, how conflicts of interest were managed:</p>

Parameter	Extraction items
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: 2009 - 2019</p> <p>Exact years of publication of studies relevant to this overview of reviews: 2009 (2 studies), 2010 (1 study), 2011 (1 study), 2012 (1 study), 2016 (1 study), 2018 (1 study), 2019 (1 study).</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 8</p> <p>Number of studies by study design: All eight included studies were cluster RCTs.</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: RCTs</p>
Types of studies included	<p>Reasons for including study design(s) provided? Yes. Authors reported inclusion of RCTs was to address gaps in the literature relating to the effectiveness of school-based interventions and to support the introduction of school health education policy changes in England.</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No information provided</p> <p>Reasons for exclusion provided? Yes. Outlined in PRISMA flow chart only</p>
Appraisal instruments used	<p>Full name of tool(s) used: Risk of bias was assessed using the Cochrane criteria</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: Not applicable</p>
Appraisal ratings	<p>The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, all included trials appeared to have a high risk of bias (k=8). With regard to blinding participants and personnel all studies had a high ROB. Low risk of bias was found with respect to incomplete outcome data and selective outcome reporting (6 studies), blinding of outcome assessors (5 studies), random sequence</p>

Parameter	Extraction items
	<p>generation (3 studies), allocation concealment (1 studies) and other source of bias related to adjustment for clustering effect (2 studies).</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No meta-analysis • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? The review authors provided minimal comment reporting that the included studies were limited in quality and quantity with heterogeneous reporting outcomes. <p>Assessment of publication bias: No, review authors stated that planned publication bias assessment could not be performed because of the paucity of trials and heterogeneity in their outcomes (page 276)</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number): Only narrative syntheses of included studies' findings were performed (page 276)</p> <ul style="list-style-type: none"> • Authors' justification for narrative synthesis or meta-analysis: Planned quantitative syntheses, sensitivity analyses, subgroup analyses and publication bias assessment could not be performed because of the paucity of trials and heterogeneity in their outcomes (page 276). Thus, meta-analysis could not quantitatively synthesise the outcome data. (page281) • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: No meta-analysis • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? No meta-analysis <p>For prospective cohort studies: not applicable</p> <ul style="list-style-type: none"> • Summary effect estimates reported separately for RCTs and prospective cohort studies: Not applicable
Outcomes assessed	<p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Changes in the prevalence and/or mean number of primary and/or permanent teeth with caries • Primary outcome 2: Changes in plaque scores and gingival health for primary and/or permanent teeth (measured by valid clinical indices)

Parameter	Extraction items
Results/findings	<ul style="list-style-type: none"> Primary outcome 3: Changes in frequency or amount of sugar intake (measured by self-reported measures or by collecting food wrappers)
	<p>META-ANALYSIS FINDINGS</p> <p>No meta-analyses conducted</p> <p>NARRATIVE SYNTHESIS</p> <p>Primary outcomes</p> <ul style="list-style-type: none"> Primary outcome 1: Changes in the prevalence and/or mean number of primary and/or permanent teeth with caries Three studies reported on dental caries. Two studies measured caries increment (Chachra 2011; Qadri 2018), and one study measured the demineralisation of the occlusal surfaces of permanent premolars and molars (Anttonen 2011). There were inconsistent findings in these studies. Whilst Chachra (2011) reported a significantly lower caries increment in the intervention groups compared to the control group, Anttonen (2011) reported contrary results showing significantly more demineralisation in the intervention than the control group. Furthermore, Qadri (2018) did not find a significant difference in caries increment between their intervention and control groups. Yet, when their findings were adjusted for age, gender and socioeconomic position, a significant difference emerged, and a lower caries increment was found in children from high socioeconomic position. Primary outcome 2: Changes in plaque scores and gingival health for primary and/or permanent teeth (measured by valid clinical indices) Three studies reported significant changes in plaque scores and gingival health (Olubunmi and Olushola, 2013 (not listed in included studies!); Saied-Moallemi 2009; Vangipuram 2016). Interventions delivered by peers (at adolescence) or with parents' involvement (at pre-adolescence) showed a reduction in plaque scores and better gingival health than those delivered by dentists / teachers or without parents' involvement, respectively (Saied-Moallemi 2009; Vangipuram 2016). Primary outcome 3: Changes in self-reported behaviours - frequency or amount of sugar intake (measured by self-reported measures or by collecting food wrappers). Five studies (Chachra 2011; Haleem 2012; Naseri-Salahshour 2019; Vangipuram 2016; Yang 2009) reported a significant reduction in self-reported sugar intake in the intervention compared to the control groups. Interventions delivered by peers showed more reduction in sugar intake compared to interventions delivered by dentists or teachers. <p>Six studies reported on oral hygiene practices, such as the frequency, time and equipment of toothbrushing as well as the use of fluoride toothpaste. Five studies reported significant improvement in oral hygiene practices in the intervention groups compared to the control group (Chachra 2011; Haleem 2012; Naseri-Salahshour 2019; Vangipuram 2016; Yang 2009). Only one study reported a reduction in the frequency of toothbrushing in the intervention group compared to the control group (Anttonen 2011).</p>

Parameter	Extraction items
	<p>Secondary outcomes Not applicable</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable</p> <ul style="list-style-type: none"> • Authors' comment on potential impact of heterogeneity on results and quality of evidence: The included studies were limited in quality and quantity with heterogeneous reporting outcomes. <p>Causes of heterogeneity investigated? Not investigated</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Heterogeneity	
Comments	

Stein *et al.* (2018) – Extraction form

Parameter	Extraction items
First author and year of publication	Stein <i>et al.</i> (2018)
Review title	Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis
Review coding	School children; Dental Health Professionals
Contributing primary studies	The information presented in this extraction form applies to all of the 12/12 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): The objective of this study was to evaluate the effectiveness of oral health educational actions in the school context on improving oral hygiene and dental caries in schoolchildren through systematic review and meta-analysis.(page 2)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: students aged 5 to 18 years • Intervention: Educational actions interventions on oral health carried out by dental professionals in School Programs: supervised toothbrushing, guidance about toothbrushing, orientation on the main oral diseases, general orientation on

Parameter	Extraction items
	<p>dieting, educational activities, among others. The intervention could have been delivered by dentists, dental hygienists or dental assistants and carried out in the school environment.</p> <ul style="list-style-type: none"> • Comparison: no educational programme on oral health provided. • Outcome: dental caries; plaque accumulation; gingivitis. Clinical effectiveness was a change in caries experience or some change in the amount of dental plaque and gingival bleeding. • Setting: a “school” is defined as “a space to articulate policies concerning teenagers and young people, based on the participation of those individuals in that process: students, families, educational and health professional • Study design: randomized controlled trials methodology were included, with randomization at group (school and/or classroom) or individual level. • Timeframe for follow-up: no time restriction

Participants

Number of participants: 3932 participants, 1864 of those included in intervention groups and 2068 in control groups.

Age (mean/mode/range): ranged from 6 to 15 years old

Gender: not reported

Details of any additional relevant participant characteristics:

Overview of relevant characteristics of primary studies included in systematic review: Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.

**Description of Interventions/
phenomena of interest**

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes
Ivanovic 1996 Yugoslavia	cRCT	240 (3 groups, n=80 per group) 11-14 year olds	Dental hygienist	OHE, OHI and TD (Group I) OHE, OHI, TD ad ST (Group II)	only dental examinations were provided: no preventive program or oral health measures were conducted.	6 months	PI and GI (Silness & Loe)

Parameter	Extraction items							
	Esteves 1998 Brazil	RCT	100 (4 groups, n=25 per group) 7-9 year olds	Dentist	OHE (Group II) OHE, OHI, TD and ST (Group III) OHE, OHI, TD and ST and dietary (Group IV)	No intervention control (Group I)	6 months	PI (O'Leary)
	Worthington 2001 England	cRCT	288 (n=146 intervention; n=135 control) 10 year olds	Dental hygienist	OHE, OHI and TD	No intervention	4 months	PI (Silness & Loe)
	Rodrigues 2003 Brazil	RCT	80 (4 groups, n=20 per group) 7-9 year olds	Dentist	OHE and OHI (Group I and II) OHE, OHI and TD (Group III)	No motivation	1 month	PI (O'Leary)
	Al-Jundi 2006 Jordan	RCT	808 (n=411 intervention; n=397 control) 6-11 year olds	Dental Hygienist and research assistant	OHE, OHI, TD and ST	Only OHI	4 years	DMFT and dmfs
	Zanin 2007 Brazil	RCT	60 (n=30 each in intervention and control groups) 6 year olds	Dentist	OHE, OHI, TD and ST	TD and ST once a year	15 months	PI, GI, dmf and DMFS
	de Farias 2009 Brazil	RCT	288 (n=195 intervention; n=93 control)	Dentist	OHE, OHI and TD	No intervention	1 month	PI, GI and DMFT

Parameter	Extraction items							
			7-15 year olds					
	Anttonen 2011 Finland	RCT	700 (n=140 intervention; n=220 control I; n=340 control II) 13-14 year olds	Dental hygienist	OHE, OHI and ST	Control I + dietary intervention; Control II no intervention	9 months	demineralization and remineralization in molars
	Yekaninejad 2012 Iran	RCT	252 (n=129 intervention; n=123 control) 11-12 year olds	Dentist	OHE	No intervention	3 months	CPI
	Haleem 2012 Pakistan	cRCT	637 (n=303 intervention; n=334 control) 10-11 year olds	Dentist	OHE, OHI and TD	No intervention	2 years	PI and GI
	D'Cruz 2013 India	RCT	568 (n=141 intervention group I; n=143 intervention group II; n=284 control) 13-15 year olds	Dentist	OHE (Group I) OHE, OHI and TD (Group II)	No intervention	9 months	PI and GI
	Chandrashekar 2014 India	RCT	71 (n=36 intervention; n=35 control) 15 year olds	Dentist	OHE	No intervention	6 months	PI, G and DMFS

Parameter	Extraction items
Setting/context	<p>Interventions: OHE (Oral Health Education: activities with lectures, albums, slides, leaflets, counselling, games, drawings, theatre, dieting guidance); OHI (Oral Health Instruction); TD (Tooth brushing demonstration); ST (supervised tooth brushing).</p> <p>Outcomes assessed: PI (Plaque index), GI (Gingival Index), DMFS (decayed, missed, filled permanent tooth surface); dmfs (decayed, missed, filled primary tooth surface); DMFT (decayed, missed, filled permanent tooth); CPI (Community Periodontal Index).</p> <p>Countries (no. studies) (in alphabetic order): Brazil (4 studies); England (1 study); Finland (1 study); India (2 studies); Iran (1 study); Jordan (1 study); Pakistan (1 study); Yugoslavia (1 study)</p> <p>Setting (no. studies): All 12 studies - school based</p> <p>Other relevant features:</p>
Databases and sources searched	<p>Protocol prepared: No</p> <ul style="list-style-type: none"> • If published, number and link: <p>Number and names of databases: 4 databases searched</p> <p>MEDLINE/PubMed (01/01/1995-23/04/2015)</p> <p>CENTRAL (Central Register Cochrane of Controlled Trials) (01/01/1995-13/05/2015)</p> <p>EMBASE (Excerpta Medica Database) (01/01/1995-09/06/2015)</p> <p>LILACS (Latin-American and Caribbean Literature on Health Sciences/Virtual Health Library (BVS)) (01/01/1995-25/04/2015)</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: No • Expert consultation: Yes. 2 reviewers were experienced in the field <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: Articles published from 01/01/1995 until 09/06/2015</p> <p>Search limits (e.g. date, language): no language restriction on publications</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported, any disagreement was resolved by decision of a third reviewer on inclusion or exclusion <p>Extraction completed in duplicate: Unclear. A verification list of extraction items was used</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported

Parameter	Extraction items
	<p>Funding of review: This study was funded in part by the Coordination for the Improvement of Higher Education Personnel (CAPES).</p> <p>Conflicts of interest declared: None declared</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: Trials were published from 1996 - 2014</p> <p>Exact years of publication of studies relevant to this overview of reviews: 1996 (1 study); 1998 (1 study); 2001 (1 study); 2003 (1 study); 2006 (1 study); 2007 (1 study); 2009 (1 study); 2011 (1 study); 2012 (2 studies); 2013 (1 study); 2014 (1 study).</p>
Number of primary studies included in the systematic review	<p>Number of primary studies: 12 RCTs</p> <p>Number of studies by study design: Among the 12 included studies, six were randomized by school, two by classroom and four by individuals.</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: RCTs</p>
Types of studies included	<p>Reasons for including study design(s) provided? No</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? Yes</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane risk of bias</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> Not applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p>

Parameter	Extraction items
	<p>The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have a high risk of bias (k=11), unclear risk of bias (k=1) and low risk of bias (k=0)</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? Not applicable • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number): Data synthesis was carried out using a descriptive synthesis, with a summary of the characteristics of each included study. For quantitative synthesis, a summary of the combined estimate related to the intervention effect was calculated as a mean of the differences of the effects of intervention in individual studies. The meta-analysis of the continuous outcomes used the fixed effect method. Mean differences and their standard deviations were analysed using Review Manager 5.3. software. (page 32)</p> <p>Significant methodological variability was found among the interventions performed in the included studies. Review authors grouped studies according to the type of intervention delivered - any Oral health education (OHE); Oral health instruction (OHI); Tooth brushing demonstration (TD); Supervised toothbrushing (ST)</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: None • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. The estimates of effect and their standard errors, deriving from the analysis of group-randomized trials, were explored in a meta-analysis using the generic inverse variance method on Review Manager 5.3. The chi-square test was used to assess whether the observed differences were homogenous or heterogeneous. The statistic test used to quantify the inconsistency between studies was the I^2.

Parameter	Extraction items
	For prospective cohort studies: NA

Outcomes assessed

List of authors' primary outcomes:

- Primary outcome 1: Change in Plaque Index with any sort of OHE intervention (Loe and Stilness PI outcome and O'Leary PI outcome)
- Primary outcome 2: Change in Plaque Index with some activity of OHE, OHI and TD (Loe and Stilness PI outcome)
- Primary outcome 3: Gingivitis outcomes with any sort of OHE intervention (Loe and Stilness Gingivitis outcome)
- Primary outcome 4: Caries status

List of authors' secondary outcomes: Not applicable

META-ANALYSIS FINDINGS

Primary outcomes: change in plaque accumulation and gingivitis

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
PI	Any OHE versus control	Loe & Stilness PI (3 studies)	Chandrashekar 2014, Ivanovic 1996, Worthington 2001.	MD -0.36 [-0.61, -0.12]	P=0.004	0%	A cumulative analysis of the 5 studies (n=307 intervention) (n=295 control) using a fixed effect method showed a reduction in plaque levels (MD -0.36, CI 95%: [-0.59, -0.13] p=0.0002) (I ² =0%).	
		O'Leary PI (2 studies)	Esteves 1998, Rodrigues 2003	MD -0.34 [-1.01, 0.32]	P=0.31	0%		
PI	OHE, OHI and TD versus control	Loe & Stilness	Ivanovic 1996, Worthington 2001.	MD -0.42 [-0.69, -0.15]	P=0.002	26%	A significant difference in the change of the plaque index favouring intervention groups was demonstrated	

Parameter	Extraction items									
	GI	Any OHE versus control	Loe & Stilness	Chandrashekar 2014, D’Cruz 2013	MD -0.07 [-0.32, 0.19]	P=0.61	0%	No significant difference in the change in gingivitis between the groups was found		

Secondary outcomes: Not applicable

NARRATIVE SYNTHESIS

Primary outcomes: change in plaque accumulation and gingivitis

2 studies (de **Farias** and **Zanin**) compared OHE, OHI and TD with control, measured plaque index and gingivitis outcomes, found significant reduction in mean values but their data, as presented, could not be included in the meta-analysis. Another study (**Haleem**) presented plaque and gingivitis scores as dichotomous measures reported a modest effect of interventions. **Yekaninejad** used the Community Periodontal Index (CPI) to measure the effect of OHE on oral hygiene found no improvement in gingival health after 3 months.

Primary outcomes: dental caries status

Four studies (**Chandrashekar**, de **Farias**, **Al-Jundi**, **Zanin**) presented results using the DMFT, DMFS and dmfs indices. In one study (Al-Jundi) caries status was found to be improved following supervised daily toothbrushing with fluoride toothpaste. Two studies (Chandrashekar, Zanin) found no significant changes in DMFT or dmft outcomes between intervention and control groups. In the de Farias study the DMFS index showed a significant association with the Gingival bleeding index at the end of the study. One study (**Anttonen**) measured the demineralization and remineralization of tooth surfaces, to establish the effect of a dietary intervention on schoolchildren's eating habits found favourable changes in dietary habits and a decrease in the laser fluorescence values of molars.

Secondary outcomes: Not applicable

Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable

Authors’ comment on potential impact of heterogeneity on results and quality of evidence: Review authors noted that the several forms of delivery of OHE presented in the studies only varied in regard to the deployed educational objects; however, the methods, as they were developed, were based mainly on information transfer.

Heterogeneity

Causes of heterogeneity investigated? No

- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**

Parameter	Extraction items
	<ul style="list-style-type: none"> If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	

Tsai *et al.* (2020) – Extraction form

Parameter	Extraction items
First author and year of publication	Tsai <i>et al.</i> (2020)
Review title	Health promotion interventions to improve oral health of adolescents: A systematic review and meta-analysis
Review coding	Adolescents; Mixed providers;
Contributing primary studies	The information presented in this extraction form applies only to 24 /28 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (studies assessing outcomes related to knowledge and attitudes and secondary outcomes as defined by systematic review authors excluded, also 2 studies that included clinical preventive measures also excluded).
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): Review authors state that the aim of this systematic review is to evaluate the effectiveness of community oral health interventions in improving the knowledge, behaviour and/or oral health status of healthy adolescents, to inform future intervention design. (page 550)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> Patient or population: Adolescents approximately 10-18 years; No co-morbidity Intervention: Oral health interventions to improve oral health status and/or improvements in oral health knowledge attitudes and practices Comparison: non-exposed control groups Outcome: Primary outcomes: Changes in plaque levels, gingivitis and caries; Secondary outcomes: Changes in oral health knowledge, attitude and practice (secondary proxy outcomes – so not of interest to the current overview) Setting: not specified Study design: RCTs and cRCTs Timeframe for follow-up: not specified

Parameter	Extraction items
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Participants

Number of participants: 12,491 totalled based on participant numbers reported for each of the 24 included studies, (2 studies (Gholami, Yang) with n=301 excluded + 2 studies (Ekstrand, Hedman) with n=634 excluded)

Age (mean/mode/range): Adolescence was defined by the authors as 10-19 years of age. No information was provided on the ages or age range of individual primary study participants.

Gender: No information provided

Details of any additional relevant participant characteristics:

Overview of relevant characteristics of primary studies included in systematic review: Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.

**Description of Interventions/
phenomena of interest**

Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Albandar (1994) Brazil Albandar 1995; Axelsson 1994; Buischi 1994; Mayer 2003	RCT	N=227	Investigator (dentist)	Oral health/hygiene education with family involvement and dental take-home products supplied	No preventive program	36 months with follow-up at end	PI, GI, ABL, DMFS,
Aleksejuniene (2012) Lithuania	cRCT	N=254	Investigator	Oral health education and counselling	No intervention	Single session, 12 month follow-up	PI
Anttonen (2011) Finland	cRCT	N=769	Dental hygienist	Oral health instruction and individual counselling	No intervention	3 sessions for 3 months, 12 month follow-up	LF
Bagley (1992) US	RCT	N=41	Investigator	Comprehensive oral health	Flossing instruction only	Single session, 6	PDI, PHP-MI, FS

Parameter	Extraction items							
					education and guidance on flossing		month follow-up	
	Brukiene (2012) Lithuania	cRCT	N=247	Investigator	Behaviour change oral health education using the authoritative parenting model	Conventional behaviour change	Over 3 months, 12 month follow-up	PI, OHI
	Chandrashekar (2014) India	cRCT	N=160	Dentist, teacher	Oral health education with dental take-home products supplied	Standard	6 months with follow-up at end	PI, GI, DMFS, OHI
	D'Cruz (2013) India	cRCT	600	Investigator (dentist)	Oral health education	No intervention	6 months with follow-up after 3 months	PI, GI
	Ekstrand (2000) Russia Excluded	RCT	100	Investigator	Oral health education + clinical preventive measures	Standard	30 months with follow-up at end	PI, GI, DMFS
	Gholami (2015) Iran Excluded		166	Investigator				None of interest
	Hägglom (2013) Sweden	RCT	267	Dentist	Oral health education with visual aids	Traditional oral health education	36 months with follow-up at end	DSA
	Haleem (2012) Pakistan Haleem 2016	cRCT	1657	Dentist, teacher, student peer	Oral health education with demonstration	No intervention	12 months with 12 month follow-up	PI, OHI, CPI, DMFT, BI

Parameter	Extraction items							
					and group discussion			
	Hausen (2000) Finland	RCT	760	Dental auxillary	Oral health education +/- clinical preventive measures and dental take-home products supplied	No intervention	36 months with follow-up at end	DMFS, MS/LB
	Hausen (2007) Finland Tolvanen 2009; Tolvanen 2010a; Tolvanen 2010b	RCT	1691	Dental auxillary	Oral health education + clinical preventive measures and dental take-home products supplied	Standard information with no intervention	36 months with follow-up at end	PI, DMFS, TC, BI
	Hebbal (2011) India	RCT	150	Investigator	Oral health education +/- visual aids	No intervention	Single session with 1.5 month follow-up	PI
	Hedman (2015) Sweden Exclude	cRCT	534	Dental auxillary	Oral health education + clinical preventive measures	No intervention	24 months with follow-up at end	DSA
	Ivanovic (1996) Yugoslavia	cRCT	240	Dental auxillary	Oral health education with dental take-home products supplied	No intervention	6 months with 6 month follow-up	PI, GI, BI, PD

Parameter	Extraction items							
	Khudanov (2018) Uzbekistan	RCT	100	Investigator	Oral health education and plaque removal training and dental take-home products supplied	Traditional learning	1 month with 1 month follow-up	PI
	Marchetti (2018) Brazil	RCT	291	Investigator	Oral health education with reinforcement App consisted of oral or video messages	Conventional learning	1 month with 3 month follow-up	GI, OHI
	Mbawalla (2013) Tanzania	cRCT	1077	Investigator	Oral health education with dental take-home products supplied	No intervention	Single session with 24 month follow-up	PI, OHI, TC, BI, DT
	Pakpour (2014) Iran	cRCT	372	Teacher	Oral health education	No intervention	Single session with 6 month follow-up	PI, TC, CPI, PedsQL™
	Redmond (1999) England Redmond 2001	cRCT	1060	Dental auxillary	Oral health education with dental take-home products supplied	No intervention	12 months with follow-up at end	PI
	Sfeatcu (2019) Romania	RCT	264	Student peer	Oral health education	No intervention	16 months with 8 month follow-up	GI, OHI, DMFS,
	Shekhawat (2016) India	RCT	264	Investigator	Oral health education with	No intervention	4 months with 2	PI, GI

Parameter	Extraction items							
					family involvement		month follow-up	
	Vangipuram (2016) India	cRCT	450	Dentist, student peer	Oral health education	No intervention	Single session with 6 month follow-up	PI, GI, OHI
	Worthington (2001) England	cRCT	741	Dental auxillary	Oral health education	No intervention	4 months with 7 month follow-up	PI
	Yang (2009) Taiwan Excluded		135	Investigator			2 months	None of interest
	Yazdani (2009) Iran	cRCT	417	Unclear	Oral health education with leaflets/video	No intervention	2 months with 3 month follow-up	PI, CPI
	Yekaninejad (2012) Iran	cRCT	392	Health education specialist	Oral health education and demonstration	No intervention	0.5 months with 3 month follow-up	OHI, TC, CPI

Abbreviations: ABL, Alveolar bone loss; BI, Bleeding index; CPI, Community periodontal index; DMFS, Decayed, missing, filled surfaces of teeth; DMFT, Decayed, missing, filled teeth; DSA, Approximal decayed surfaces; DT, decayed teeth; FS, Flossing score; GI, Gingival index; LF, Laser fluorescence values; MS/LB, Streptococcus Mutans/Lactobacilli scores; OHI, Oral hygiene index/level/status; PD, Probing pocket depth; PDI, Periodontal Disease Index; PedsQL™, Paediatric oral health-related quality of life; PHP-MI, Modified Personal Hygiene Performance Index; PI, Plaque index/scores.

Countries (no. studies) (in alphabetic order): Included interventions from 14 countries:

Setting/context

Brazil (2 studies), England (2 studies), Finland (3 studies), India (5 studies), Iran (3 studies), Lithuania (2 studies), Pakistan (1 study), Romania (1 study), Sweden (1 study), Tanzania (1 study), US (1 study), Uzbekistan (1 study), Yugoslavia (1 study)

Parameter	Extraction items
Databases and sources searched	<p>Setting (no. studies): Most studies were conducted within school environments with only three (Haggblom 2013, Hausen 2000, Ivanovic 1996) in a clinic setting</p> <p>Other relevant features:</p> <p>Protocol prepared: Yes. Are community oral health interventions effective in improving the knowledge, behaviour, and/or health status of healthy adolescents; a systematic review</p> <ul style="list-style-type: none"> • If published, number and link: Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD42017073563 <p>Number and names of databases: 5 databases searched MEDLINE, Pre-MEDLINE, Embase, PsychINFO and the Cochrane Database</p> <p>Other non-database sources: no information provided</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: Yes. Hand-searching the reference lists of primary studies and review articles was conducted. • Expert consultation: No <p>Search strategy/key words provided: Yes. Search strategy and inclusion/exclusion criteria provided in Appendix S1</p> <p>Time period covered by searches: January 1987 up to September 2019</p> <p>Search limits (e.g. date, language): all rcts in any language included in search.</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Yes. Review authors state that year restrictions were used to identify strategies appropriate for current social norms. <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Disagreements were resolved by a third author <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Disagreements were resolved by a third author <p>Funding of review: No information provided by authors, protocol states no funding source</p> <p>Conflicts of interest declared: No information provided by authors, protocol states none known</p> <p>If declared, how conflicts of interest were managed:</p>
Date Range (years) of included studies	<p>Date range for included studies relevant to this overview of reviews: Publication dates ranged from 1992 to 2019</p> <p>Exact years of publication of studies relevant to this overview of reviews: 1992 (1 study), 1994 (1 study), 1996 (1 study), 1999 (1 study), 2000 (1 study), 2001 (1 study), 2007 (1 study), 2009 (1 study), 2011 (2 studies), 2012 (4 studies), 2013 (3 studies), 2014 (2 studies), 2016 (2 studies), 2018 (2 studies), 2019 (1 study).</p>

Parameter	Extraction items
Number of primary studies included in the systematic review	<p>Number of primary studies: 24 studies included in the current synthesis (28 unique RCTs included in review with 37 publications)</p> <p>Number of studies by study design: 10 RCTs; 14 cluster RCTs</p> <p>Funding of primary studies: No information</p> <p>Conflicts of interest of primary studies: No information</p> <p>Planned study design(s) to be included: RCTs and cluster RCTs</p>
Types of studies included	<p>Reasons for including study design(s) provided? No information provided</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? Not provided</p> <p>Reasons for exclusion provided? No</p>
Appraisal instruments used	<p>Full name of tool(s) used: The Downs and Black criteria were used to assess methodological quality of included studies</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes as a scored item within the internal validity/bias section • Blinding of assessors: Yes included as a scored item within the internal validity/bias section • Sequence allocation (individual vs group randomisation): Yes included as a scored item within the internal validity/confounding section • Selective reporting: Yes covered in the reporting bias section <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u> Not applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors used the Downs and Black criteria to assess methodological quality of included studies referencing Downs and Black 1998 feasibility study which utilises a 27-item questionnaire with a maximum of 28 points. The authors do not provide information on how they defined the levels other than to comment that scores ranged from 48% to 96%, with a mean score and standard deviation of $73 \pm 11\%$ (all 37 associated publications included in assessment).</p> <p>There is no universally accepted standard cut off point determining the level of quality, however the HRB notes that commonly cited thresholds are:</p> <p>excellent 26-28 (93-100%); good 20-25 (71-92%); fair/moderate 15-19 (54-70%); and poor <14 (<53%).</p> <p>Based on this scoring system the number of included studies:</p>

Parameter	Extraction items
	<p>by low/poor quality (k=1), fair/moderate quality (k=7), high quality, good (k=15), high quality, excellent (k=1).</p> <p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes <p>Assessment of publication bias: No</p> <p>Review authors noted that when reviewing intervention studies, publication bias must always be considered, including tendency to publish more studies with positive findings or highlight positive outcomes. They reported that there is a high chance of publication bias in the studies of this review, but it is impossible to determine the effect this has on the findings.</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
<p>Method of analysis</p>	<p>Authors description of method of analysis (include page number): Meta-analysis was conducted on the most predominant index for each outcome measure: gingival health (Löe and Silness Gingival Index), plaque scores (Silness and Löe Plaque Index) and dental caries (DMFS). To address the high heterogeneity of intervention outcomes, common for health promotion studies, the studies were subdivided into simple oral health 'education-only', or 'comprehensive' interventions.</p> <p>P values <.05 were considered to be statistically significant, and heterogeneity was quantified using chi-square test and I² statistic. Subgroups were compared using Welch's t test with Welch-Satterthwaite approximate degrees of freedom. All analyses were conducted in R. (page 550)</p> <p>Authors' justification for narrative synthesis or meta-analysis: no information provided</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? <p>Each overall effect was calculated as a maximum likelihood estimator, where each study was weighted by its inverse-square standard error of the mean. Where studies reported results from different intervention study arms (eg dentist or teacher-led), they were included in the meta-analysis separately.</p> <p>For prospective cohort studies: Not applicable</p>

Parameter	Extraction items
Outcomes assessed	<ul style="list-style-type: none"> • List of authors' primary outcomes: The primary clinical outcomes assessed included gingivitis, plaque levels and dental caries. For meta-analysis studies were subdivided into 'comprehensive' interventions or 'simple education only' interventions versus control • Primary outcome 1: Gingival health (Löe and Silness Gingival Index) 5 of the 13 studies including 12 outcomes could be included in meta-analysis. • Primary outcome 2: Plaque score (Silness and Löe Plaque Index) 8 of the 21 studies including 15 outcomes could be included in meta-analysis. • Primary outcome 3: Dental caries (DMFS) 6 of the 9 studies including 11 outcomes could be included in meta-analysis <p>List of authors' secondary outcomes: not applicable</p>

META-ANALYSIS FINDINGS

Primary outcomes

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Gingival health	Comprehensive oral health education programme vs control	Improvement in Löe and Silness Gingival Index (0-3 score range)	4 studies (n=652) Vangipuram 2016 (peer-led); Chandrashekar 2014 (teacher-led); Ivanovic 1996 (2 arms OHE/OHE+); Shekhawat 2016 (classroom + wider family)	MD: -0.45 [95% CI: -0.80, -0.10]	0.012	98%	Pooled analysis from 4 studies reported significant improvement in comprehensive oral health education compared with control groups with high heterogeneity where more negative results	3 - 6 month follow up

Parameter	Extraction items								
								indicate favouring of intervention	
	Gingival health	Simple oral health education programme vs control	Improvement in Löe and Silness Gingival Index (0-3 score range)	4 studies (n=1173) Vangipuram 2016 (dentist-led); Chandrashekar 2014 (dentist-led and teacher-led); D’Cruz 2013 (lecture and lecture + demo); Shekhawat 2016 (classroom only and wider family only)	MD: -0.07 [95% CI: -0.1, -0.05]	<0.001	55%	Pooled analysis from 4 studies reported significant improvement in simple oral health education compared with control groups with moderate heterogeneity where more negative results indicate favouring of intervention	3 - 6 month follow up
	Plaque score	Comprehensive oral health education programme vs control	Reduced plaque scores (Silness and Löe Plaque Index) (0-3 range)	7 studies (n=2612) Vangipuram 2016 (peer-led); Worthington 2001 (wider family + group projects); Chandrashekar 2014 (teacher-led); Ivanovic 1996 (2 arms OHE/OHE+); Redmond 1999	MD: -0.43 [95% CI: -0.66, -0.2]	<0.001	99%	Pooled analysis from 7 studies reported significant reduction in plaque scores in comprehensive oral health education compared with control groups	3 - 40 month follow up

Parameter	Extraction items								
				(OHE with products and family); Shekhawat 2016 (classroom and wider family); Hausen 2007 (OHE, demo and products)				with high heterogeneity	
	Plaque score	Simple oral health education programme vs control	Reduced plaque scores (Silness and Loe Plaque Index) (0-3 range)	4 studies (n=755) Hebbal 2011 (OHE +/- av aids); Vangipuram 2016 (dentist-led); Chandrashekar 2014 (dentist-led, no products and teacher-led, no products); Shekhawat 2016 (classroom only and wider family only)	MD: -0.24 [95% CI: -0.41, -0.07]	0.006	84%	Pooled analysis from 4 studies reported significant reduction in plaque scores in simple oral health education compared with control groups with high heterogeneity. 3 studies reported increases in plaque scores	1.5 - 6 month follow up
	Dental caries	Comprehensive oral health education programme vs control	DMFS	5 studies (n=1186) Chandrashekar 2014 (teacher-led); Ekstrand 2000 excluded from	-1.15 [95% CI: -1.9, -0.41]	0.002	92%	Pooled analysis from 5 studies reported 1.2 fewer newly decayed tooth surfaces than	6 – 40 month follow up

Parameter	Extraction items								
				current review (+ clinical preventive measures); Hausen 2007 (OHE, demo and products @ 24 and 40 months); Axelsson/Albandar 1994 (OHE, demo and products); Hausen 2000 (OHE, demo and products)				the control group	
Dental caries	Simple oral health education programme vs control	DMFS	3 studies (n=322) Chandrashekar 2014 (dentist-led and teacher-led no products); Sfeatcu 2019 (OHE); Axelsson/Albandar 1994 (OHE)	0.07 [95% CI: -0.06, 0.19]	0.302	0%	Pooled analysis from 3 studies reported no significant difference	6 – 36 months follow up	

Secondary outcomes: Not applicable

NARRATIVE SYNTHESIS

Primary outcomes

Gingival health

The difference of the means between comprehensive and education-only interventions was 0.4 (SE = 0.2, P = 0.1).

Plaque scores

Parameter	Extraction items
Heterogeneity	<p>The difference of the means between intervention subgroups was 0.2 (SE = 0.1, P = 0.22). Twelve outcomes were reported as statistically significant with only three interventions (Chandrashekar, Vangipuram, Hebbal), all from the education-only subcategory, reporting increases in plaque scores.</p> <p>Dental caries</p> <p>The difference of the means between intervention subgroups was 1.2 (SE = 0.4, P = 0.01).</p> <p>Overall findings</p> <p>Statistically significant results, on any outcome, appeared to be more frequent in studies with longer duration (≥ 12 months) (Hausen, Albandar, Redmond, Haleem, Haggblom) than shorter programmes (< 12 months) (Ivanovic, Worthington, Aleksejuniene, Brukiene, Mbawalla, Anttonen, Chandrashekar, Khudanov, Shekhawat, Bagley, Vangipuram, D’Cruz, Hebbal, Pakpour, Yazdani, Yekaninejad). This was particularly true with caries outcomes, where all studies with comprehensive interventions and duration ≥ 12 months were statistically significant, while shorter term interventions or those with education-only arms were not.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Not applicable</p>
	<p>Authors’ comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Review authors noted that in general, the heterogeneity was lower in the education-only meta-analyses and to a large degree, unsuccessful in improving clinical measures. The meta-analyses involving comprehensive interventions were quite heterogeneous with some components appearing to show greater efficacy than others. The intervention characteristics that appeared to contribute to these positive outcomes were involvement of community, peer-to-peer learning, use of behavioural theory, and participant self-diagnosis, which ranged from participants identifying their own gingival bleeding sites or plaque levels to receiving personalized visual tools displaying active caries.</p> <p>Causes of heterogeneity investigated? No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	

von Helde *et al.* (2024) – Extraction form

Parameter	Extraction items
First author and year of publication	von Helde <i>et al.</i> (2024)
Review title	Are educational tools in oral health programs for pregnant women effective in improving the oral status of mothers and babies? A systematic review
Review coding	Pregnant women; Babies; Mixed providers: Dental professionals, health professionals, nurse
Contributing primary studies	The information presented in this extraction form applies to the 6/9 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): Are educational tools in OHPs for pregnant women effective in improving the oral health of mothers and their babies up to 2 years old?</p> <p>The aim of this study was to evaluate, through a systematic review, the effectiveness of oral health programmes (OHPs) containing educational tools (ETs), during prenatal care, in improving the oral status of mothers and babies.</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: pregnant women and pregnant women and their babies up to 2 years of age • Intervention: Education tools in OHPs for pregnant women: digital material (text messages, social network, DVD and audios), printed material (folders, pamphlets, and handouts), and verbal guidance (create a connection with the patient and transmit knowledge more directly). • Comparison: without ETs • Outcome: oral conditions, such as dental caries, gingivitis and the presence of dental biofilm • Setting: not specified • Study design: randomized or non-randomized studies • Timeframe for follow-up:
Participants	<p>Number of participants: 1972 (2259 less 3 studies) pregnant women participated in the studies, and 1219 babies were evaluated.</p> <p>Age (mean/mode/range): The age of the pregnant women ranged from 15 to 45 years and the studies that analysed the babies (n = 3) started the follow-up at 6 months and ended at 25 months</p> <p>Gender: Women; gender of babies not reported</p> <p>Details of any additional relevant participant characteristics:</p>
Description of Interventions/ phenomena of interest	Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers)

Parameter	Extraction items						
and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.							
Overview of relevant characteristics of primary studies included in systematic review:							
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest
Deghatipour (2021) Iran didactic material + digital material + verbal guidance	Field study non-randomised.	N=436 babies of pregnant women in the 2nd and 3rd trimester and >15 years of age. Health centres	Dentist (group a & b), Professional health service provider (PHSP) (group a & c), PhD student in public oral health (group d)	Messages about a healthy diet & oral hygiene: Group a: content from all groups - comprehensive Group b: 7 group sessions & lectures by dentist Group c: face-to-face with PHSP Group d: Phd student posted messages on social network – audios, videos, text messages weekly	Routine maternal care	During pregnancy until 24 months postpartum follow-up	Caries free babies Caries index

Parameter	Extraction items							
	Deghatipour (2022) Iran didactic material + digital material + verbal guidance	Field study non-randomised.	N=454 pregnant women in the 2nd and 3rd trimester and >15 years of age. Health centres	Dentist (group a & b), PHSP (group a & c), PhD student (group d)	Messages about a healthy diet & oral hygiene: Group a: content from all groups - comprehensive Group b: 7 group sessions & lectures by dentist Group c: face-to-face with PHSP Group d: Phd student posted messages on social network – audios, videos, text messages weekly	Routine maternal care	During pregnancy until 24 months postpartum follow-up	DMFT Caries index
	Hu (2022) China didactic material + digital material + verbal guidance	RCT	N=222 women 8–10 weeks pregnant University Hospital	Dentist	Face-to-face health education using conversations, posters and folders, and	No intervention	4 times: 1st, 2nd and 3rd trimester and postpartum. Follow-up during pregnancy until postpartum	DMFT Caries index + periodontal parameters

Parameter	Extraction items							
					online chats with other pregnant women and with a professional on an interactive platform			
	Plutzer and Spencer (2008) Australia Didactic material + verbal guidance	RCT	N=441 babies of nulliparous at 5–7 months of gestation Public University Hospital	Dentist	Information leaflets covering oral health, hygiene, & diet, during pregnancy & when baby was 6 & 12 months with additional scripted telephone consultation (subgroup a)	Standard care	Follow-up during pregnancy until 18 months postpartum	S-ECC Caries index
	Adams (2017) US Didactic material + verbal guidance	Controlled pilot study non-randomised	N=95 mothers Non-profit Maternity prenatal care model	Nurse	Several prenatal maternal & infant oral health education sessions on good oral	Standard care	3 sessions until approximately 9 weeks postintervention	Plaque index + periodontal parameters

Parameter	Extraction items							
					health + practical instruction			
	Jamieson (2018) Australia Verbal guidance	RCT	N=324 babies of pregnant women with aboriginal babies Health centres	Dentist	motivational interviewing guidance on individualized oral health, infant feeding, erupted teeth, oral hygiene	No intervention	During pregnancy until 24 months postpartum	DMFT Caries index
	Lin (2011) Canada Excluded	Prospective non-randomised before-after	N=61 Pregnant women over 35 weeks Clinics associated with the program	Dental hygienist				Plaque, calculus, gingival bleeding, pocket and gingival depth indices
	Geisinger (2014) US Excluded	Prospective non-randomised pilot study	N=114 mothers University Hospital	Dentist				Plaque index and gingival index
	Chawla (2017) India Excluded	Longitudinal non-randomised study	N=112 mothers	Dentist				CPITN, DMFT

DMFT: decayed, missing, filled teeth; S-ECC: severe early childhood caries;

Setting/context

Countries (no. studies) (in alphabetic order): Australia (2 studies), China (1 study), Iran (2 studies), US (1 study)

Parameter	Extraction items
	<p>Setting (no. studies): Health centres (3 studies), University Hospital (2 studies), Non-profit Maternity prenatal care model (1 study)</p> <p>Other relevant features:</p> <p>Protocol prepared: Yes</p> <ul style="list-style-type: none"> • If published, number and link: https://www.crd.york.ac.uk/PROSPERO/view/CRD42023398089 <p>Number and names of databases:</p> <p>4 databases were searched: PubMed, Scopus, Embase, Web of Science and Cochrane databases.</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes: performed in OpenGrey and Google scholar • Reference chasing: Yes: Manual searches were performed from the reference lists of the included studies • Expert consultation: Not reported • In addition, alerts were created on each platform, so that the study search could be updated until August 2023. <p>Search strategy/key words provided: Yes. Provided in supplementary material</p> <p>Time period covered by searches: until August 2023</p> <p>Search limits (e.g. date, language): No year or language restrictions set</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? Not applicable <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported, consensus meetings held and a third author with experience on the subject for final decisions <p>Extraction completed in duplicate: Not reported clearly</p> <p>If yes, rate of agreement:</p> <p>Funding of review: The authors declare that this study was funded by the Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ - N° E-26/204.541/2021), the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).</p> <p>Conflicts of interest declared: The authors declare no competing interests.</p> <p>If declared, how conflicts of interest were managed:</p> <p>Date range for included studies relevant to this overview of reviews: 2008 - 2022</p>
Date Range (years) of included studies	<p>Exact years of publication of studies relevant to this overview of reviews: 2008 (1 study), 2017 (1 study), 2018 (1 study), 2021 (1 study), 2022 (2 studies) (excluded (2011 (1 study), 2014 (1 study), 2017 (1 studies)))</p>

Parameter	Extraction items
Number of primary studies included in the systematic review	<p>Number of primary studies: 6 of 9 studies (3 studies with no comparison group not included)</p> <p>Number of studies by study design: Of the included studies 3 were RCTs, 3 were non-randomised studies</p> <p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: randomised and non-randomised studies</p>
Types of studies included	<p>Reasons for including study design(s) provided? Not reported</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? No not reported</p> <p>Reasons for exclusion provided? Yes/No</p>
Appraisal instruments used	<p>Full name of tool(s) used: Cochrane risk of bias tools for randomized studies - RoB 2.0 and ROBINS-I for nonrandomized studies</p> <p><u>For RCTs, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of:</u></p> <ul style="list-style-type: none"> • Confounding: Yes • Selection bias: Yes • Exposure and outcomes: Yes • Selective reporting: Yes
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>Of the included studies 3 were RCTs: High risk of bias (low quality) (k=1), unclear/moderate risk of bias (unclear/moderate q quality) (k=1), low risk of bias (high quality) (k=1)</p> <p>Of the included non-randomised controlled studies: Low risk of bias (high quality) (k=2), a moderate risk of bias (unclear/moderate quality) (k=0), a critical risk of bias (low quality) (k=1)</p>

Parameter	Extraction items
	<p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)): Review authors reported that studies that did not report blinding of the examiners and that this could influence the results were classified with "some concerns"; and those who followed for a limited time (< 12 months) received the classification of "high risk of bias". When the p-value, standard deviation and exclusion criteria of the participants were not reported, they were considered at "serious risk of bias". Studies that did not present sample calculation, reasons and number of participants dropping out, selection of participants by convenience (such as specific health conditions and more motivated pregnant women) presented "critical risk of bias". (page 3)</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No meta-analysis • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? Yes discussed <p>Assessment of publication bias: As part of certainty of evidence assessment for dental biofilm, periodontal parameters and mother's caries index and baby's caries index, publication bias was assessed but no further details provided</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number):</p> <p>Review authors report they planned a descriptive analysis. (page 2) The characterization of the studies was mentioned in the data extraction topic. It was analysed descriptively, and the results were presented in tables through absolute and percentage values.</p> <p>Authors' justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors' justification for combining data in meta-analysis: No meta-analysis conducted • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Not applicable <p>For prospective cohort studies:</p> <ul style="list-style-type: none"> • Statistical combination of data adjusted for confounding (not raw data): Not applicable • Authors' justification for combination of raw data where adjusted estimates were not available (include page number):

Parameter	Extraction items
Outcomes assessed	<ul style="list-style-type: none"> • Summary effect estimates reported separately for RCTs and prospective cohort studies: No <p>List of authors' primary outcomes:</p> <ul style="list-style-type: none"> • Primary outcome 1: Caries prevention – babies • Primary outcome 2: Plaque reduction/Periodontal parameters - mothers <p>List of authors' secondary outcomes: not applicable</p>
Results/findings	<p>META-ANALYSIS FINDINGS not applicable no meta-analysis conducted</p> <p>Primary outcomes</p> <p>NARRATIVE SYNTHESIS</p> <p>Primary outcomes – Caries prevention in babies</p> <p>Review authors reported that all studies with babies (n = 3) were successful in preventing caries.</p> <p>In the study by Deghatipour 2021, in which the influence of the OHP using didactic material + digital material + verbal guidance on the prevention of caries in early childhood was evaluated, babies whose mothers had face-to-face contact with health agents had better results (91.9% caries-free) than the babies whose mothers received information only through the social network (Telegram channel with behavioral and nutritional content in the form of audios, videos and text messages) (59.6% caries-free). According to this study, the worse result may be because breastfeeding mothers are involved with the newborn and do not pay the same attention to educational information received via social media when compared to information received in face-to-face meetings with a dentist or health professional.</p> <p>In another study (Plutzer & Spencer) OHP using didactic material + advanced verbal guidance in the three-round format (during pregnancy, 6 and 12 months of age) significantly reduced incidence of severe early childhood caries (S-ECC) was reported.</p> <p>Didactic material + verbal guidance using motivational interviewing (Jamieson) proved to be effective to reduce cavitated caries lesions in babies after 24 months, as there was a statistical difference between the intervention group and the control group for the outcome of cavities in babies. Summary estimates not reported.</p> <p>Plaque reduction/Periodontal parameters in women: Review authors reported that mothers showed a reduction in biofilm, caries and periodontitis after interventions.</p> <p>In one study (Hu) review authors reported no difference observed in caries and periodontal disease rates after 12 months of intervention (didactic material + digital material + verbal guidance) observed, although both intervention and control groups showed improvements. There were higher number of active caries in the control group.</p>

Parameter	Extraction items
	<p>In the Deghatipour 2022 study, the OHP also using didactic material + digital material + verbal guidance led to a reduction in the number of decayed teeth and restoration of untreated teeth.</p> <p>Verbal guidance provided by a nurse was able to reduce the plaque index, gingival index and pocket depth after two months (Adams) and there was a statistical difference in oral outcomes between the intervention and post-intervention control groups. Summary estimates not reported.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes</p>
	<p>Authors' comment on potential impact of heterogeneity on results and quality of evidence:</p>
Heterogeneity	<p>Causes of heterogeneity investigated? No</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Comments	<p>6 studies included: analysis of mothers or babies oral health;</p> <p>All interventions included some element of verbal guidance either alone or:</p> <ul style="list-style-type: none"> didactic material + digital material + verbal guidance (3 studies) didactic material + verbal guidance (2 studies) verbal guidance (1 study)

Xiang *et al.* (2020) – Extraction form

Parameter	Extraction items
First author and year of publication	Xiang <i>et al.</i> (2020)
Review title	The effectiveness of behavioral interventions to improve oral health in adolescents at different periods of follow-up: A systematic review and meta-analysis
Review coding	Behavioural interventions; Adolescents; Mixed providers
Contributing primary studies	The information presented in this extraction form applies to all 17/17 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews (studies assessing outcomes related to knowledge and attitudes and secondary outcomes as defined by systematic review authors excluded).

Parameter	Extraction items																
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): The aim of this review was to examine the effectiveness of behavioral interventions at different follow-up periods to improve adolescents' oral health. (abstract page 725) Review authors noted that the evidence supporting the efficacy of oral health behavior intervention in adolescents is scarce. Therefore, it is essential to analyze the effectiveness of behavioral interventions on oral health in adolescents. (page 726)</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: 10–19 years old at baseline • Intervention: behavioral interventions aimed at improving oral health • Comparison: a negative control group • Outcome: change of oral health knowledge, attitudes [not of interest to current overview], practices and oral health status (e.g. oral hygiene index, plaque index (PI), gingival index (GI)) • Setting: not specified • Study design: randomized controlled trial (RCT) design mostly cluster randomisation at classes or schools' level. Only 1 randomised at individual level. • Timeframe for follow-up: 																
Participants	<p>Number of participants: 8124 calculated from individual study numbers</p> <p>Age (mean/mode/range): 10 – 16-year-olds</p> <p>Gender: not specified</p> <p>Details of any additional relevant participant characteristics:</p> <p>The duration of the follow-ups ranged from two weeks to three years. The targeted behaviors included tooth brushing skills, flossing instruction, oral health knowledge and dietary suggestions. The number of sessions included in these studies ranged from 1 to 8. Most of intervention contained 3–4 sessions</p>																
Description of Interventions/ phenomena of interest	<p>Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers) and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.</p> <p>Overview of relevant characteristics of primary studies included in systematic review: Among the 17 studies, 15 evaluated oral hygiene status.</p>																
	<table border="1"> <thead> <tr> <th>Primary study</th> <th>Study design</th> <th>No. participants</th> <th>Provider</th> <th>Intervention</th> <th>Comparator</th> <th>Duration</th> <th>Outcomes of interest</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest								
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes of interest										

Parameter	Extraction items							
	Vangipuram 2016 India	cRCT (Unclear ROB)	N=450 12–15- year-olds n=150 peer group; n=150 dentist group; n=150 control	Peer or dentist	Using power- point presentation, chalk and talk presentation, using charts, posters, booklets and tooth brushing demonstration models (1 single session)	No intervention	3 months & 6-month follow-up	GI PI Oral health practice
	Redmond (1999) England	cRCT (Unclear ROB)	N=1063 11– 13-year-olds n=570 intervention; n=493 control	Dental facilitators	Tooth brushing instructions and dietary suggestions. Toothbrushes, toothpaste, and disclosing tablets were provided for home use (3 session for 6 months)	No intervention	6-month follow-up	PI Oral health practice
	Aleksejuniene (2012) Lithuania	cRCT (Unclear ROB)	N=254 12–13- year-olds n=89 intervention; n=84 conventional group;	Unclear	PAPM-based oral presentation + different counselling at different stages on dietary	Conventional: oral presentation Control: no intervention	3 months & 12-month follow-up	IQPI

Parameter	Extraction items							
			n=81 control		suggestions, oral hygiene methods (1 session, no reinforcements after 6 months)			
	Ivanovic (1996) Yugoslavia	cRCT (High ROB)	N=240 11–14-year-olds n=80 intervention 1; n=80 intervention 2; n=80 control	Dental facilitators	Intervention 1: toothbrush, toothpaste and instruction, dietary suggestions, oral health; Intervention 2: toothbrush, toothpaste, dental floss and instruction (8 sessions for 6 months, no reinforcements after 6 months)	no preventive program	3-month, 6 months & 12-month follow-up	GI PI PBI PD
	Yekaninejad (2012) Iran	cRCT (Unclear ROB)	N=392 11–12-year-olds n=131 HBM intervention; n=127 conventional group; n=134 control	Dentist	Conventional toothbrush and flossing instruction + HBM-based motivation; Conventional instruction	No intervention	2 weeks & 3-month follow-up	OHI-S CPI

Parameter	Extraction items							
					(3 sessions for 2 weeks)			
	Albandar (1994) Brazil	RCT (Unclear ROB)	N=227 13year olds n=79 intensive group; n=72 conventional group; n=76 control	Dentist	intensive oral hygiene training: 3 visits with group session and parent participation; conventional oral hygiene training (4 sessions for first 4 months, reinforcements: 3 times per year for 3 years)	No preventive program	1 year, 2 years & 3- year follow- up	PI BI DMFS DFS Bone loss Oral health habits
	Vuokko Anttonen (2011) Finland	cRCT (Unclear ROB)	N=499 13year olds n=140 intervention; n=359 control	Dental facilitator	Oral health instruction and individual counselling (3 sessions for 2 months, no reinforcements after 6 months)	No intervention	1 year follow-up	Oral health habits LF
	Pakpour (2013) Iran	cRCT (Unclear ROB)	N=372 14–16- year-olds n=124 gain- framed intervention; n=126 loss-	Dental facilitator teacher	Gain-framed or loss-framed message pamphlets on oral health behaviors	No intervention	2 weeks & 24 weeks follow-up	PedsQL™ VPI CPI Oral health behaviour

Parameter	Extraction items							
			framed intervention; n=122 control		(1 session)			
	Worthington (2001) England	cRCT (Unclear ROB)	N=310 10-year-olds n=166 intervention; 144 controls	Dental facilitator	4 one-hour lessons on oral health, practices and diet suggestions (4 sessions for 4 months)	No intervention	4-month follow-up	PI Oral health behaviour
	Abdul Haleem (2012) Pakistan	cRCT (Unclear ROB)	N=1657 10–11-year-olds 5 parallel groups: n=333 dentist-led, n=333 teacher-led, n=341 peer-led, n=326 self-learning, n=324 control	Dentist; Teacher; Peer; Self;	Oral health education, brushing demonstration, question-answer and group activities (1 one-hour session, reinforcements: once per month for a year)	No intervention	18-month follow-up	OHS Oral health behaviour
	Chandrashekar (2014) India	cRCT (Unclear ROB)	N=120 15-year-olds 4 groups: dentist led; teacher led I and II; control n=40 per group	Dentist or teacher	Oral health education with Dentist led: audio-visual aids Teacher led I: screening for gross calculus deposits, debris	Initial health education at baseline, no additional	6-month follow-up	OHI-S GI PI DMFS

Parameter	Extraction items							
					on a fortnightly basis Teacher led II: screening + oral hygiene aids (toothbrush and toothpaste) (every fortnight for 6 months)			
	D'Cruz (2013) India	cRCT (Unclear ROB)	N=568 13–15-year-olds n=141 intervention group I; n=143 intervention group II; n=284 control	Dentist	Oral health education with Group I: PowerPoint presentation Group II: PowerPoint + model tooth brushing demonstration (1 session, reinforcements: at 3 months and 6 months)	No intervention	3-month, 6 month & 9-month follow-up	Oral health practice VPI GI
	Aleksejuniene (2016) Lithuania	cRCT (High ROB)	N=197 15–16-year-olds n=98 intervention group; n=99 control	Dentist	3 face-to-face educational hands-on sessions (3 sessions for 3 weeks, no reinforcements after 6 months)	No intervention	6 months & 12-month follow-up	IQPI

Parameter	Extraction items							
	Yazdani (2009) Iran	cRCT (Unclear ROB)	N=417 15- year-olds n=148 intervention group I leaflet; n=139 intervention group II video; n=130 control	Unclear	Oral health education through a leaflet or a videotape (3 sessions for 8 weeks)	No intervention	12-week follow-up	PI BI
	Wickremasinghe (2017) Sri Lanka	cRCT (Unclear ROB)	N=584 15- year-olds n=196 HBM- based intervention I; n=191 conventional II; n=197 control	Dentist	Oral health education with HBM based Presentation + Discussion + Demonstration; or Conventional: didactic education: Lecture + Discussion + Demonstration; (1 session)	No intervention	6-month follow-up	Oral health practice Gingival bleeding on probing, Presence of dental plaque
	Yang (2009) China	cRCT (Unclear ROB)	N= 135 13- year-olds n=67 intervention; n=68 control	Unclear	Oral health education: eight modules included lectures, role- playing, small group	No intervention	4-week follow-up	Questionnaire: Oral health knowledge, behaviour

Parameter	Extraction items							
					discussion and group contests (8 sessions for 8 weeks)			
	Walsh (1995) USA	cRCT (Unclear ROB)	N=639 12–14-year-olds n=399 intervention; n=240 control	Unclear	Oral health education: Four one-hour educational sessions and diet suggestions (4 sessions for 2 weeks)	No intervention	2-week follow-up	Questionnaire: Oral health knowledge, attitude and practices

PAPM: precaution Adoption Process Model; HBM: health belief model;

BI: bleeding index; CPI: community periodontal index; DMFS: decayed, missing, filled surfaces; DFS: decayed, filled surfaces; GI: gingival index; IQPI: the Individual Quantitative Plaque % Index; LF: laser fluorescence; OHI: oral health intervention; OHS: oral hygiene status; PedsQL™: Paediatric Quality of Life Inventory; PFRI: Plaque Formation Rate Index; V/PI: visual/ plaque index; PD: the probing pocket depth.

Countries (no. studies) (in alphabetic order): 17 studies included: Brazil (1 study), China (1 study), England (2 studies), Finland (1 study), India (3 studies), Iran (3 studies), Lithuania (2 studies), Pakistan (1 study), Sri Lanka (1 study), United States (1 study) and Yugoslavia (1 study).

Setting/context

Setting (no. studies): All of the included studies were conducted in schools

Other relevant features:

Databases and sources searched

Protocol prepared: Yes. The current systematic review was registered in the International Prospective Register of Systematic Reviews (PROSPERO)

- **If published, number and link:** Registration number: CRD42018090341 Available from <https://www.crd.york.ac.uk/PROSPERO/view/CRD42018090341>

Number and names of databases: 5 databases were used: CENTRAL via Cochrane Library

Parameter	Extraction items
	<p>MEDLINE via OVID EMBASE via OVID the HKU Scholars Hub Web of Science.</p> <p>Other non-database sources:</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: Yes - Google Scholar • Reference chasing: Yes - the reference lists for all eligible articles were hand searched for any further related studies. • Expert consultation: No <p>Search strategy/key words provided: Yes - listed in Appendix Table</p> <p>Time period covered by searches: A literature search (from January 1985 to January 2018)</p> <p>Search limits (e.g. date, language): reports written in English</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? No <p>Screening completed in duplicate: Yes. Disagreements between two reviewers were resolved by discussion or if needed, consulting of a third professional.</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported <p>Extraction completed in duplicate: Yes. 2 reviewers extracted data from all eligible studies</p> <ul style="list-style-type: none"> • If yes, rate of agreement: not reported <p>Funding of review: Authors declared that the research did not receive any funding from granting agencies in the public, commercial, or not-for-profit sectors.</p> <p>Conflicts of interest declared: Authors declared that there is no conflict of interest.</p> <p>If declared, how conflicts of interest were managed:</p> <p>Date range for included studies relevant to this overview of reviews: 1985 - 2017</p>
<p>Date Range (years) of included studies</p>	<p>Exact years of publication of studies relevant to this overview of reviews: 1985 (1 study), 1994 (1 study), 1996 (1 study), 1999 (1 study), 2001 (1 study), 2009 (2 studies), 2011 (1 study), 2012 (3 studies), 2013 (2 studies), 2014 (1 study), 2016 (2 studies), 2017 (1 study)</p>
<p>Number of primary studies included in the systematic review</p>	<p>Number of primary studies: 17 studies in systematic review included in current overview synthesis</p> <p>Number of studies by study design: all RCTs (cRCTs and 1 individual RCT)</p>

Parameter	Extraction items
Types of studies included	<p>Funding of primary studies: Not reported</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: RCTs</p> <p>Reasons for including study design(s) provided? Not reported</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>List of excluded studies at full text provided? Yes</p> <p>Reasons for exclusion provided? Yes List and explanations for their exclusion in appendix</p>
	<p>Full name of tool(s) used: Critical Appraisal Checklist as recommended by the Joanna Briggs Institute (JBI). Five additional items dedicated to behavioral interventions were evaluated according to the evidence-based behavioral medicine (EBBM) guidelines. Risk of bias was rated based on methods recommended by the Cochrane Handbook</p> <p>For RCTs, record Yes/No for appraisal instrument assessment of:</p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: Not Applicable</p>
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors did not provide an overall assessment of risk of bias for each trial. For bias evaluation, all studies had at least one section of bias. The HRB notes that Cochrane’s Handbook suggests that low overall risk of bias is considered if all domains are judged as Low risk (k=0). The included studies appear to have High overall risk where one or more domains are judged as high risk (k=2) and Unclear overall risk of bias where one or more domains are judged as unclear risk (k=15) and none are low risk No graphical information provided in the paper, overall risk of bias judged from supplemental tables of individual ROB assessments</p> <p>Authors’ comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <p>The authors noted that “Overall, the quality of the included studies was, in general, poor given that all studies were subjected to different levels of risk. The majority of trials failed to utilize random sequence generation and allocation concealment in order to optimize randomization procedures. The effective sample size was small in several studies after adjusting for the unit-of-analysis</p>

Parameter	Extraction items
	<p>error as a result of cluster randomization. Due to the wide variability of intervention planning and the lack of rigorous intervention monitoring, a random effects model was used at the cost of precision estimates.”</p> <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No. Minimal discussion, impact of risk of bias and certainty of evidence not reported <p>Assessment of publication bias: Not reported</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? • If yes, authors’ comment of likelihood and magnitude of publication bias (include page number(s)):
Method of analysis	<p>Authors description of method of analysis (include page number): A meta-analysis was conducted in RevMan using a random effects model considering the heterogeneity among studies (e.g. settings, countries, and implementation of interventions). (p page 727) Given that all the included studies were randomized at the class or school unit to avoid contamination within classes and schools, the sample size of each study was adjusted to reduce the unit-of-analysis error.</p> <p>Authors’ justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> • If meta-analysis was conducted, authors’ justification for combining data in meta-analysis: the standardized mean difference (SMD) and 95 % confidence interval (CI) were calculated with various plaque indices; gingival indices were combined to compare the mean difference (MD) and 95 % CI. For other outcome data, quantitative analysis was not possible due to the deficiency of studies or the non-uniformity of measurements • Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes. The effects of each study were weighted according to the adjusted effective sample size (no additional weightings were done). If a study had more than one intervention group, all interventional groups including behavioral interventions were pooled to create a single pair-wise comparison as described in the Cochrane Handbook <p>For prospective cohort studies: Not Applicable</p>
Outcomes assessed	List of authors’ primary outcomes:

Parameter	Extraction items
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- Primary outcome 1: oral hygiene status (e.g. oral hygiene index, plaque index (PI), gingival index (GI)) reported on immediate effects (2-4 weeks), short term effects (3-4 months), long term effects (6 months and longer)
- Primary outcome 2: oral health practices

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings	Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
	Oral hygiene status – short term 3 months	behavioural intervention versus no intervention	GI	3 studies (n=157) D’Cruz 2013, Ivanovic 1996, Vangipuram 2016	MD -0.06 [-0.16, 0.04]	0.22	0%	Pooled analysis from 3 RCTs (n=96 intervention; n=61 control) reported no significant differences from behavioral interventions on the GI after three months (MD -0.06, 95% CI -0.16, 0.04).	
			PI	5 studies (n=509) Aleksiejuniene 2012, Chandrashekar 2014, Ivanovic 1996, Vangipuram 2016, Worthington 2001	SMD -0.46 [-0.82, -0.10]	0.01	70%	Pooled analysis from 5 RCTs (n=302 intervention; n=207 control) reported significant plaque accumulation (SMD:-0.46; 95 % CI -0.82, -0.10) In addition, review authors reported 1 study (Yekaninejad 2012) observed significant decrease in oral hygiene index-simplified (OHI-S)	

Parameter	Extraction items									
Oral hygiene status – long term 6 months								and community periodontal index (CPI), effect estimate not reported.		
		behavioural intervention versus no intervention	PI	8 studies (n=788) Aleksejuniene 2016, Chandrashekar 2014, D’Cruz 2013, Ivanovic 1996, Pakpour 2013, Redmond 1999, Vangipuram 2016, Wickremasinghe 2017	SMD -0.71 [-1.08, -0.33]	0.0001	80%	Pooled analysis from 8 RCTs (n=473 intervention; n=315 control) reported significant decrease in PI after 6 months (SMD -0.71; 95 % CI -1.08, -0.33) In addition, review authors reported Chandrashekar 2014 also measured oral hygiene index, and saw it decreased significantly		
			GI	5 studies (n=310) Chandrashekar 2014, D’Cruz 2013, Ivanovic 1996, Vangipuram 2016, Wickremasinghe 2017	SMD -0.90 [-1.33, -0.47]	0.0001	64%	Pooled analysis from 5 RCTs (n=202 intervention, n=108 control), incorporating the median into the meta-analysis reported significant decrease in GI after 6 months (SMD -0.90; 95 % CI -1.33 - 0.47) Review authors also note 1 study (Ivanovic) measured a significant		

Parameter	Extraction items									
									decrease in bleeding index but not pocket depth In general, the oral health status of adolescents reverted back to the baseline levels after one year if behavioral reinforcements were not made after 6 months.	
Oral hygiene status – long term 12 months			PI	3 studies (n=198) Aleksejuniene 2012, Aleksejuniene 2016, Ivanovic 1996	SMD -0.15 [-0.44, 0.14]	0.31	0%		Pooled analysis from RCTs (n=125 intervention, n=73 control), PI did not differ between groups without reinforcement of oral health messages (SMD: -0.15; 95 % CI: -0.44, 0.14) Review authors report that 3 studies with reinforcement of messages maintained a significant improvement in oral health up to 3 years (no effect estimates provided)	

Secondary outcomes not applicable

NARRATIVE SYNTHESIS

Primary outcomes. Immediate oral health status (no meta-analysis was conducted due to different measurements)

Parameter	Extraction items
	<p>Two RCTs (Yekaninejad 2012; Pakpour 2013) reported significant improvement in plaque index after 2 weeks while other clinical assessments remained unchanged using theory-based behavioural oral health education and instruction compared with no intervention.</p> <p>Primary outcomes. Long term oral health status</p> <p>Review authors suggest based on findings from 1 study (Ivanovic) GI and BI reverted back to baseline levels after 6-month duration if participants were not given further instructions.</p> <p>Review authors reported three studies (Chandrashekar, Anttonen, Albandar) that reported on the long-term effects of oral health behavioral interventions on caries. In one study (Chandrashekar), no effect on caries status was found after the 6-month intervention. In another (Anttonen) laser fluorescence mean values of demineralisation of molars decreased after 1 year. In the last study (Albandar) a significant decrease in DMFS after intervening for 3 years was noted.</p> <p>Primary outcomes. Oral health practices – immediate effects</p> <p>Immediate effects were observed in 3 studies (Pakpour 2013; Yazdani 2009; Walsh 1985) for oral health behaviours of increased frequency in tooth brushing and decreased smoking habits, which were most evident in girls. Only slight improvements were observed at 3 months in 3 studies (Redmond 1999; Pakpour 2013; Vangipuram 2016)</p> <p>Oral health practices – Long term</p> <p>Review authors reported a significant improvement in oral health-related quality of life after 6 months in one study (Pakpour 2013). Oral health knowledge, practices and attitudes were all found to have improved after 6–9 months of behavioral interventions in 5 studies (Wickremasinghe 2017; Redmond 1999; D’Cruz 2013; Pakpour 2013; Vangipuram 2016). Reports of oral health knowledge, attitudes, and quality of life greater than 1 year could not be identified for this review.</p> <p>Separate summaries reported for RCTs and non-randomised studies when included in the same review? Yes/No</p> <p>Authors’ comment on potential impact of heterogeneity on results and quality of evidence:</p> <p>Causes of heterogeneity investigated? Not reported</p> <ul style="list-style-type: none"> • If yes, describe methods (e.g. subgroup/sensitivity analysis) • If yes, provide a brief indication of the extent of heterogeneity in the relevant results:
Heterogeneity	
Comments	

Xiang *et al.* (2021) – Extraction form

Parameter	Extraction items
First author and year of publication	Xiang <i>et al.</i> (2021)
Review title	The application of theory-guided oral health interventions in adolescents: a systematic review and meta-analysis of randomized controlled trials
Review coding	Adolescents; Theory-guided; Some unclear providers
Contributing primary studies	The information presented in this extraction form applies only to the 10/10 primary studies included in the systematic review that were deemed relevant to the purposes of the current overview of reviews.
Objectives	<p>Review research question(s) and/or objectives (including page number(s)): “The purposes of this review are to: 1) summarize the existing theories that have been adopted in oral health promotion for adolescents; 2) analyse the efficacy of theory-guided interventions on clinical oral health outcomes and oral health behaviours; 3) compare the short-term and long-term effects of theory-based intervention to conventional oral health education on oral hygiene status.”p881</p> <p>PICO elements reported in Introduction/Methods:</p> <ul style="list-style-type: none"> • Patient or population: Adolescents within the age range of 10–19 years old at the beginning of the study • Intervention: Theory-guided randomized controlled trials aimed at improving oral health • Comparison: No intervention or just receiving regular curriculum-based health education programs without any theory. • Outcome: Primary outcomes: clinical oral health outcomes, e.g. plaque index, dental caries, oral hygiene index; Secondary outcomes: oral health-related behaviours, e.g. tooth brushing and flossing behaviours. • Setting: Not reported • Study design: RCTs • Timeframe for follow-up: Not reported
Participants	<p>Number of participants: Not reported</p> <p>Age (mean/mode/range): Not reported</p> <p>Gender: Male and female</p> <p>Details of any additional relevant participant characteristics: NA</p> <p>All studies recruited a 1:1 ratio of boys to girls except for one study which only recruited girls</p>
Description of Interventions/ phenomena of interest	Definition of intervention as per umbrella review authors (include page number): Any primary prevention oral health promotion programmes that aim to develop personal skills in individuals and/or in healthcare professionals or carers (family or formal carers)

Parameter	Extraction items						
	and/or aim to create supportive environments by addressing common risk factors and clarifying opportunities to make changes conducive to health.						
	Overview of relevant characteristics of primary studies included in systematic review:						
Primary study	Study design	No. participants	Provider	Intervention	Comparator	Duration	Outcomes
Dziaugyte (2017) Lithuania	RCT	Self-efficacy = 112 Conventional = 94 15–16-year-olds	Dentists	Self-efficacy: face-to-face interventions by dentists	Conventional: one-time dental instruction	6 months, 12 months	% Oral cleanliness scores, self-efficacy constructs
Aleksejuniene (2016) Lithuania	RCT	Social Cognitive Theory (SCT) = 98 Control = 99 15–16-year-olds	Peers and dentists	SCT: face-to-face interventions by peers and dentists	No intervention	6 months, 12 months	Individual Quantitative Plaque % Index (IQPI), SCT constructs
Gholami (2015) Iran	RCT	Health Action Process Approach (HAPA) = 69 Control = 97 11–15-year-olds	Not reported	HAPA: multicomponent intervention	No intervention	4 weeks	Flossing behavior, HAPA constructs
Pakpour (2014) Iran	RCT	Gain-framed = 124 Loss-framed = 126 Control = 122	Not reported	Prospect Theory: pamphlets	No intervention	2 weeks, 24 weeks	Brushing and flossing, Visual Plaque Index (VPI),

Parameter	Extraction items							
			15-year-olds					Community Periodontal Index (CPI)
	Nammontri (2013) Thailand	RCT	Sense of Coherence (SOC) = 133 Control = 128 10–12-year-olds	Teachers	SOC: classroom activities by teachers	No intervention	2 weeks, 3 months	DMFT, dental trauma, Community Periodontal Index (CPI), anomalies, SOC constructs
	Yekaninejad (2012) Iran	RCT	Health Belief Model (HBM) 1 = 131 Health Belief Model (HBM) 2 = 127 Control = 134 12-year-olds	Health education specialist, teachers, school staff, and parents	HBM 1: classroom-based sessions and homework by a health education specialist HBM 2: HBM 1 + parents and school staff, teachers received a five-page booklet	No intervention	2 weeks, 3 months	Brushing and flossing, Oral Hygiene Index-Simplified (OHI-S), Community Periodontal Index (CPI), HBM constructs
	Haleem (2012) Pakistan	RCT	Dentist-led = 333 Teacher-led = 333	Dentists, teachers or peers	3 SCT group: booklets + posters + instructions by dentists, teachers or	No intervention	2 years	Oral health behaviors, Oral hygiene status

Parameter	Extraction items							
			Peer-led = 341		peers			
			Conventional = 326		Conventional: booklet			
			Control = 324					
			10-11-year-olds					

Paper only described 7 out of 10 included studies. They did not describe the following studies (n=3):

Aleksejuniene & Brukiene, 2012;

Brukiene & Aleksejuniene, 2012;

Redmond et al., 2001

Countries (no. studies) (in alphabetic order):

- Iran – 3 studies (Gholami (2015), Pakpour (2014), Yekaninejad (2012))
- Lithuania – 2 studies (Dziaugyte (2017), Aleksejuniene (2016))
- Pakistan – 1 study (Haleem (2012))
- Thailand – 1 study (Nammontri (2013))

Setting/context

Setting (no. studies): Not reported

Other relevant features: NA

Protocol prepared: Yes

- **If published, number and link:**

CRD42020150750

<https://www.crd.york.ac.uk/PROSPERO/view/CRD42020150750>

Number and names of databases: Six electronic databases were searched from 1 Jan 1990 to 21 March 2019.

Databases and sources searched

- Medline
- EMBASE
- PubMed
- PsycINFO
- Cochrane Library
- CRD

Parameter	Extraction items
Date Range (years) of included studies	<p>Other non-database sources: Not reported</p> <p>Details of any other supplementary searches:</p> <ul style="list-style-type: none"> • Grey literature search: No • Reference chasing: Yes • Expert consultation: No <p>Search strategy/key words provided: Yes</p> <p>Time period covered by searches: From 1 Jan 1990 to 21 March 2019</p> <p>Search limits (e.g. date, language): English language</p> <ul style="list-style-type: none"> • Are search limits justified/appropriate? No <p>Screening completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Disagreements regarding study inclusion between reviewers were resolved with consultation from a third reviewer <p>Extraction completed in duplicate: Yes</p> <ul style="list-style-type: none"> • If yes, rate of agreement: Not reported <p>Funding of review: The research received the financial support from Dr. Wong Haiming, Clinical Associate Professor, Paediatric Dentistry Unit of the Faculty of Dentistry, the University of Hong Kong</p> <p>Conflicts of interest declared: No potential conflict of interest was reported by the authors.</p> <p>If declared, how conflicts of interest were managed: NA</p> <p>Date range for included studies relevant to this overview of reviews: 2001-2017</p> <p>Exact years of publication of studies relevant to this overview of reviews:</p> <ul style="list-style-type: none"> • 2001 - 1 study (Redmond (2001)) (not reported) • 2012 - 4 studies (Aleksejuniene (2012), (not reported) Brukiene (2012), (not reported) Haleem (2012), Yekaninejad (2012)) • 2013 - 1 study (Nammontri (2013)) • 2014 - 1 study (Pakpour (2014)) • 2015 - 1 study (Gholami (2015))(secondary outcomes only)) • 2016 - 1 study ((Aleksejuniene (2016)) • 2017 - 1 study (Dziaugyte (2017))
Number of primary studies included in the systematic review	<p>Number of primary studies: 11 papers included (7 described in characteristics table)</p> <p>Number of studies by study design: 11 papers 10 studies included in systematic review, 7 described</p>

Parameter	Extraction items
Types of studies included	<ul style="list-style-type: none"> • Randomized controlled trials – 10 studies (Aleksejuniene (2012), Aleksejuniene (2016), Brukiene (2012), Dziaugyte (2017), Gholami (2015), Haleem (2012), Nammontri (2013), Pakpour (2014), Redmond (2001), Yekaninejad (2012)) <p>Funding of primary studies: No</p> <p>Conflicts of interest of primary studies: Not reported</p> <p>Planned study design(s) to be included: Randomized controlled trials</p> <p>Reasons for including study design(s) provided? Yes</p> <ul style="list-style-type: none"> • If yes, describe the reasons(s): <p>The authors chose RCTs because they wanted to evaluate the effectiveness of theory-guided interventions compared to traditional oral health education. They note that "previous reviews comparing theory-guided interventions with conventional oral health education programs were conducted using observational design" and they wanted to investigate effectiveness "based on evidence from randomized controlled trials."</p> <p>List of excluded studies at full text provided? No</p> <p>Reasons for exclusion provided? No</p>
Appraisal instruments used	<p>Full name of tool(s) used:</p> <ul style="list-style-type: none"> • Methodological quality assessments for preliminary included studies were performed according to the assessment tool developed for the reviews of interventional studies in oral health (Kay & Locker, 1997). A higher score indicates better quality, whereas a lower score indicates poorer quality. • Risk of bias of each included study was rated according to the Cochrane Handbook which fell into the category of "high risk," "low risk" or "unclear risk" (Green, 2011). Authors redefined the criterion for performance bias (blinding of participants and personnel) to allow for the difficulty in achieving double-blind criteria in education programmes. <p><u>For RCTs, record Yes/No for appraisal instrument assessment of: ROB tool (Cochrane)</u></p> <ul style="list-style-type: none"> • Concealment of allocation: Yes • Blinding of assessors: Yes • Sequence allocation (individual vs group randomisation): Yes • Selective reporting: Yes <p><u>For prospective cohort studies, record Yes/No for appraisal instrument assessment of: NA</u></p>

Parameter	Extraction items
Appraisal ratings	<p>Number of studies by high risk of bias (low quality), unclear/moderate risk of bias (unclear/moderate quality), and low risk of bias (high quality):</p> <p>The authors did not provide an overall assessment of risk of bias for each trial. However, the HRB notes that according to Cochrane's Collaboration tool, and graphical information provided in the paper, the included trials appeared to have</p> <ul style="list-style-type: none"> • High risk of bias (low quality): 3 studies - Aleksejuniene (2016), Brukiene (2012), Redmond (2001) • Unclear/moderate risk of bias (unclear/moderate quality): 6 studies - Aleksejuniene (2012), Dziaugyte (2017), Gholami (2015), Nammontri (2013), Pakpour (2014), Yekaninejad (2012) • Low risk of bias (high quality): 1 study - Haleem (2012)
	<p>Authors' comments on risk of bias and how it affected the synthesis/analysis and certainty of evidence (include page number(s)):</p> <p>The authors make very minimal connection between their risk of bias assessment and its impact on their synthesis/analysis:</p> <ol style="list-style-type: none"> 1. P884: They simply report the risk of bias results ("one study scored low risk across all seven sections") without discussing implications 2. P889: When discussing evidence strength, they mention "based on outcome measurements, studies were (a) not objective and (b) not blinded" - this relates to performance and detection bias but they don't explicitly link this to their risk of bias assessment or discuss how it might have affected their pooled estimates 3. P889: They note "The strength of the conclusions was not high based on the limited amount of studies" - but this is about quantity, not quality/bias 4. P891: They state "the certainty of the evidence was low" but don't explicitly tie this to the risk of bias findings <ul style="list-style-type: none"> • Only low risk of bias RCTs included in review: No • Only low risk of bias RCTs included in meta-analysis: No • If studies with high or uncertain/moderate risk of bias or non-randomised studies of interventions were included in the synthesis, was there sufficient discussion of likely impact of risk of bias on results and certainty of evidence in the summary/discussion/conclusions? No <p>Assessment of publication bias: No</p> <ul style="list-style-type: none"> • If yes, how was publication bias assessed? NA • If yes, authors' comment of likelihood and magnitude of publication bias (include page number(s)): <p>The authors stated that "not including unpublished research might introduce publication bias; unpublished studies may have insignificant results and neglecting them may overestimate the effect size (Green, 2011); (e) heterogeneity and publication bias can be detected by funnel plot; however, this method should not be used in our study because we had fewer than 10 studies in</p>

Parameter	Extraction items
	<p>the metaanalysis and the test power is usually too low to distinguish chance from real asymmetry (Green, 2011; Sterne et al., 2011).”p890-891</p>
<p>Method of analysis</p>	<p>Authors description of method of analysis (include page number):</p> <p>“A meta-analysis on aggregated data of plaque scores was conducted to compare the pooled mean difference (MD) or standardized mean difference (SMD) and 95% confidence intervals in RevMan 5.3. For other outcomes, meta-analysis was not suitable due to the lack of data. Where evidence of missing outcomes was found, attempts were made to obtain any available data directly from the study authors. Since the drop-out rate was low among the included studies, only the available cases were included in meta-analysis (Green, 2011). The subgroup analyses for short-term (3 months) and long-term (one year or longer) effectiveness of plaque score were conducted. A random effects model was used considering the high degree of heterogeneity of psychological theories. In accounting for the fact that the majority of studies were cluster-randomized to avoid contamination, the effective sample size of each study was calculated to eliminate the unit-of-analysis error (Green, 2011). The intra-cluster correlation coefficient was set at 0.05 based on the Cochrane Handbook (Green, 2011). If a study had more than one theory-guided interventional group, all eligible groups were pooled, creating single pair-wise comparisons (Green, 2011). The individual studies were weighted based on their effective sample size. The assessments of heterogeneity were carried out using the v2 test and the I2 statistic. The significance of any heterogeneity was reported.” p883-884</p> <p>Authors’ justification for narrative synthesis or meta-analysis:</p> <ul style="list-style-type: none"> <p>If meta-analysis was conducted, authors’ justification for combining data in meta-analysis:</p> <p>P883: "A meta-analysis on aggregated data of plaque scores was conducted to compare the pooled mean difference (MD) or standardized mean difference (SMD)"</p> <p>P883: "For other outcomes, meta-analysis was not suitable due to the lack of data"</p> <p>The authors conducted meta-analysis only for plaque scores where they had sufficient comparable data, and used narrative synthesis for other outcomes</p> <p>Was an appropriate weighting technique used in meta-analyses, with adjustment for heterogeneity where necessary? Yes -</p> <p>The authors appropriately used random effects modeling, adjusted for clustering, and assessed/reported heterogeneity.</p> <p>For prospective cohort studies: NA</p>
<p>Outcomes assessed</p>	<p>List of authors’ primary outcomes:</p>

Parameter	Extraction items
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- **Primary outcome 1:** Oral hygiene, measured as the presence of plaque and calculus

List of authors' secondary outcomes:

- **Secondary outcome 1:** Oral health-related behaviours, measured as brushing and flossing frequency not included in current overview

META-ANALYSIS FINDINGS

Primary outcomes

Results/findings

Outcome	Intervention vs. comparator	Measure	Primary studies contributing to analysis	Summary estimate	p-value	I ² (%)	Results (Direction of effect, n, effect estimate, 95% CI, p value, heterogeneity)	Additional information
Short-term effect (3 months)								
Oral hygiene status	Theory-guided interventions vs. conventional oral health education	Plaque index	2 studies - Aleksejuniene (2012), Brukiene (2012)	MD: -5.94, (95% CI -16.39, 4.51)	p = 0.99	0%	n=27 (experimental) n=28 (conventional) figures from forest plot In the short-term (3 months), a statistically significant difference was not found in plaque reduction (MD: -5.94, 95% CI: -16.39 to 4.51), with no evidence of heterogeneity (p = 0.99, I ² = 0%)	
Long-term effect (≥ 12 months)								
Oral hygiene status	Theory-guided interventions vs. conventional oral health education	Plaque index	4 studies - Aleksejuniene (2012), Brukiene (2012), Dziaugyte (2017),	SMD: -0.25, (95% CI -0.46, -0.04)	p = 0.38	2%	n= 352 (experimental) n= 142 (conventional) In the long-term (≥ 12 months), a significant reduction in plaque was found using theory-guided	

Parameter	Extraction items							
			Haleem (2012)					interventions compared to conventional interventions (SMD: -0.25, 95% CI: -0.46 to -0.04), with no evidence of heterogeneity ($p = 0.38$, $I^2 = 2\%$)

Secondary outcomes - NA

NARRATIVE SYNTHESIS – N/A

Separate summaries reported for RCTs and non-randomised studies when included in the same review? N/A

Authors' comment on potential impact of heterogeneity on results and quality of evidence:

The authors made limited comments:

- **P883:** They used "A random effects model...considering the high degree of heterogeneity of psychological theories"
- **P889:** They report the heterogeneity statistics but don't discuss their impact since heterogeneity was low ($I^2 = 0\%$ for short-term; $I^2 = 2\%$ for long-term)

Authors report they "also encountered large variations in treatment session intervals, total intervention time, and in the individual delivering the intervention, which likely have a strong influence on the success of interventions."(p 890)

Causes of heterogeneity investigated? Yes

- **If yes, describe methods (e.g. subgroup/sensitivity analysis)**

Methods used:

- Subgroup analysis by time (p883): "The subgroup analyses for short-term (3 months) and long-term (one year or longer) effectiveness of plaque score were conducted"
- Handling multiple intervention groups (p883): "If a study had more than one theory-guided interventional group, all eligible groups were pooled, creating single pair-wise comparisons"
- **If yes, provide a brief indication of the extent of heterogeneity in the relevant results:**

Short-term analysis (3 months) (p889): "with no evidence of heterogeneity ($p = 0.99$, $I^2 = 0\%$)"

Long-term analysis (≥ 12 months) (p889): "with no evidence of heterogeneity ($p = 0.38$, $I^2 = 2\%$)"

Heterogeneity

Comments

Authors stated they included 10 studies (11 articles) but only provide a summary of 7 studies and then included 2 of the studies in the meta-analysis that they had not summarised.

Appendix E Quality assessment – HRB-adapted AMSTAR 2

The AMSTAR 2 critical appraisal tool for systematic reviews includes randomised or non-randomised studies of healthcare interventions, or both. The HRB-adapted version of AMSTAR 2 for use in this overview of reviews is below.

The notation for the HRB adapted version of AMSTAR 2 is as follows:

- **An asterisk *** following a number denotes a critical factor.
- **Text in red** indicates an exclusion factor.
- **Text in purple** indicates agreed adaptations and interpretation.

These factors are included in the screening criteria. Any systematic review that searched less than two databases and/or has not completed any quality assessment or risk of bias assessment will be excluded.

HRB-adapted AMSTAR 2 Master file

HRB-adapted AMSTAR 2 instrument		
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>Four of five components must be in the introduction or methods to be awarded a YES</p> <p>For Yes to PICO:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Population <input type="checkbox"/> Intervention <input type="checkbox"/> Comparator group <input type="checkbox"/> Outcome <input type="checkbox"/> Time frame for follow-up 	<input type="checkbox"/> Yes <input type="checkbox"/> No
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: Protocol must be reported as prepared and accessible</p> <p>The authors state that they had a written protocol or guide that included ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment <p>For 'full' Yes: Protocol must be registered and accessible</p> <p>As for partial yes, plus the protocol should be registered and should also have specified:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, <i>and</i> <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol 	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>Must have justified their rationale for selecting the study design to be awarded a YES</p> <p>They provide the study design a-priori but not an explanation NO</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only NRSI <input type="checkbox"/> OR Explanation for including both RCTs and NRSI 	<input type="checkbox"/> Yes <input type="checkbox"/> No

HRB-adapted AMSTAR 2 instrument

- 4* Did the review authors use a comprehensive literature search strategy? Yes
 Partial Yes
 No

For Partial Yes (all the following):

- searched at least two databases (relevant to research question) (Less than two fatal flaws and exclude)
- provided keyword and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes, should have (two or more of the following):

- searched the reference lists/bibliographies of included studies (moved from below and considered necessary step)
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

- 5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

- 6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

- 7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- Justified the exclusion from the review of each potentially relevant study

- 8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- time frame for follow-up

Removed points on detailed description as overlap with criteria above.

HRB-adapted AMSTAR 2 instrument

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

No quality assessment or risk of bias completed on primary studies (fatal flaw and **exclude**)

Did the authors use the correct instrument for the included study design(s)?

Did the authors assess the relevant points, see below?

Randomised controlled or clinical trials

For Partial Yes, must have assessed RoB from

- unconcealed allocation (randomization and blinding combined when allocating the intervention), and
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), and
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting (using only the outcomes or measurements that provide the researchers with their desired answer and ignoring other outcomes that may contradict the desired findings)

Non-randomised epidemiological studies.

For Partial Yes, must have assessed RoB:

- from confounding, and
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, and
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting (using only the outcomes or measurements that provide the researchers with their desired answer and ignoring other outcomes that may contradict the desired findings)

- Yes
- Partial Yes
- No
- Includes only

- Yes
 - Partial Yes
 - No
 - Includes only
- RCTs NRSI

10 Did the review authors report on the sources of funding for the studies included in the review?

- Yes
- No

For Yes,

- Must have reported on the sources of funding for individual studies included in the review. Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies

11* If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

Randomised controlled or clinical trials

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

If heterogeneity present: completed feasibility analysis to decide what studies to include (PICO for clinical heterogeneity) and what type of meta-analysis to use (pairwise [2 arm trials and two competing interventions] versus network [three or more arm trials])

- Yes
- No
- No meta-analysis

HRB-adapted AMSTAR 2 instrument

and more than two competing interventions]), used a random effects model if statistical heterogeneity is greater than an pre-agreed level (25%, 50% or 75%), estimate statistical heterogeneity (Q or I² test), determine influence of highly weighted studies (any one study influencing the outcome), high risk or unclear risk of bias studies (removed from analysis), or studies with different populations, comparators and intervention formats through sensitivity or subgroup analysis

- Yes
- No
- No meta-analysis

Non-randomised epidemiological studies

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from NRSI that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary estimates for RCTs and NRSI separately when both were included in the review

If heterogeneity present: completed feasibility analysis to decide what studies to include (PICO for clinical heterogeneity) and what type of meta-analysis to use (pairwise [2 arm trials and two competing interventions] versus network [three or more arm trials and more than two competing interventions]), studied controls for confounding, used confounding adjusted risk or odds ratios, used a random effects model if statistical heterogeneity is greater than an pre-agreed level (25%, 50% or 75%), estimate statistical heterogeneity (Q or I² test), determine influence of highly weighted studies (any one study influencing the outcome), high risk or unclear risk of bias studies (removed from analysis), or studies with different populations, comparators and intervention formats through sensitivity or subgroup analysis

12 If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

- Yes
- No
- No meta-analysis

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

Note: It is not good practice to combine RCT and NRSI, therefore separate results should be provided, and their similarities or differences discussed

13* Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?

- Yes
- No

For Yes:

- included only low risk of bias RCTs in the review
 - included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
 - OR, if RCTs with moderate or high RoB, or NRSI were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary
- Generally, NRSI have more positive results than RCTs because of self-selection bias and lack of randomization and readers should be reminded of this. Confounding should be controlled for in the meta-

HRB-adapted AMSTAR 2 instrument

analysis by using adjusted odds ratios. Loss to follow-up should be controlled for in the inclusion criteria. Loss to follow-up of over 20% introduces a serious bias to longitudinal studies.
Risk of bias should also be discussed for narrative analysis
Risk of bias should concentrate of the areas that were at high risk or unclear risk of bias its effect on the direction of the results

- 14 Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? Yes No

For Yes:

There was no significant heterogeneity in the results
 OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results (feasibility assessment, random effects model, sensitivity and subgroup analysis) and discussed the impact of this on the results of the review and the quality of evidence
If narrative analysis completed, the effects of clinical heterogeneity on the results and quality of evidence should be discussed

- 15* If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? Yes No No meta-analysis

For Yes:

performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias
Publication bias occurs when results of published studies are systematically different from unpublished or grey literature studies. Publication bias is trying to estimate the influence of unpublished studies on the results of the systematic review. Publication bias can be controlled for through a good comprehensive search strategy that includes unpublished studies, yet to be published studies, or studies published in grey literature and a wide selection of databases.
Publication bias can be measured using a funnel plot and its p-value. A funnel plot is a scatter plot of estimates of the treatment effects of each study against the measure of its precision (1/Standard Error). In the absence of publication bias, plot will look like symmetric inverted funnel. A minimum of ten studies is required to run the funnel plot analysis.
The effect of publication bias should be considered in the GRADE quality of evidence

- 16 Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? Yes No

For Yes:

The authors reported no competing interests OR
 The authors described their funding sources and how they managed potential conflicts of interest
In this case, the industry producing dental products are the main source of conflict of interest

Summary of flaws

Item	Flaws	Rationale
1	Did the research questions and inclusion criteria for the review include the components of PICO?	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	
3	Did the review authors explain their selection of the study designs for inclusion in the review?	
4*	Did the review authors use a comprehensive literature search strategy?	
5	Did the review authors perform study selection in duplicate?	
6	Did the review authors perform data extraction in duplicate?	
7*	Did the review authors provide a list of excluded studies and justify the exclusions?	
8	Did the review authors describe the included studies in adequate detail?	
9*	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	
10	Did the review authors report on the sources of funding for the studies included in the review?	
11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	
Overall		

Critical domains for overall quality assessment

	Critical domain*	Decision
1	Protocol registered before commencement of the review (item 2*)	
2	Adequacy of the literature search (item 4*)	
3	Justification for excluding individual studies (item 7*)	
4	Risk of bias assessment of the individual studies included in the review (item 9*)	
5	Appropriateness of meta-analytical methods (item 11*)	
6	Consideration of the risk of bias when interpreting the results of the review (item 13*)	
7	Assessment of presence and likely impact of publication bias (item 15*)	

Overall Quality Ratings

Score	Criteria	Rating
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High	No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest
Moderate	More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review
Low	One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest
Critically low	More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies
*Downgrade	*Multiple non-critical weaknesses may diminish confidence in the review, and it may be appropriate to move the overall appraisal down from moderate to low confidence.

Source: Shea et al. 2017

Abuhaloob *et al.* (2019) – Quality assessment

Item		Scoring
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>For Yes to PICO:</p> <p><input checked="" type="checkbox"/> Population</p> <p><input checked="" type="checkbox"/> Intervention</p> <p><input checked="" type="checkbox"/> Comparator</p> <p><input checked="" type="checkbox"/> Outcome</p> <p><input type="checkbox"/> Timeframe for follow-up</p>	<p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p>
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?</p> <p>The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible</p> <p>The authors state that they had a written protocol or guide that included ALL the following:</p> <p><input type="checkbox"/> review question(s)</p> <p><input type="checkbox"/> a search strategy</p> <p><input type="checkbox"/> inclusion/exclusion criteria</p> <p><input type="checkbox"/> a risk of bias assessment</p> <p>For 'full' Yes: Protocol must be registered and accessible</p> <p>As for partial yes, plus the protocol should be registered and should also have specified:</p> <p><input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and</p> <p><input type="checkbox"/> a plan for investigating causes of heterogeneity</p> <p><input type="checkbox"/> justification for any deviations from the protocol</p>	<p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Partial Yes</p> <p><input checked="" type="checkbox"/> No</p>
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <p><input type="checkbox"/> Explanation for including only RCTs</p> <p><input type="checkbox"/> OR Explanation for including only prospective cohort studies</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p>

Item		Scoring
	<input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies	
4*	Did the review authors use a comprehensive literature search strategy?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
	For Partial Yes (all of the following): <input checked="" type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input checked="" type="checkbox"/> provided key word and/or search strategy <input checked="" type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) For 'full' Yes (two or more of the following): <input type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field	
5	Did the review authors perform study selection in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes, either ONE of the following: <input checked="" type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer	
6	Did the review authors perform data extraction in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes, either ONE of the following: <input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies <input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer	
7*	Did the review authors provide a list of excluded studies and justify the exclusions?	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
	For Partial Yes: <input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review For 'full' Yes, must also have: <input type="checkbox"/> justified the exclusion from the review of each potentially relevant study	
8	Did the review authors describe the included studies in adequate detail?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
	For Partial Yes (ALL the following): <input checked="" type="checkbox"/> adequately described populations <input checked="" type="checkbox"/> adequately described interventions <input checked="" type="checkbox"/> described comparators <input checked="" type="checkbox"/> described outcomes <input checked="" type="checkbox"/> described research designs For 'full' Yes, should also have ALL the following: <input checked="" type="checkbox"/> described study's setting <input checked="" type="checkbox"/> timeframe for follow-up	

Item		Scoring
9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p>	<p>Randomised controlled trials or clinical trials: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input type="checkbox"/> Includes only prospective cohort studies</p> <p>Non-randomised prospective cohort studies <input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Includes only randomised controlled trials / clinical trials</p>

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

unconcealed allocation AND

lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

from confounding, AND

from selection bias

For Yes, must also have assessed RoB:

methods used to ascertain exposures and outcomes, AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	<p>Did the review authors report on the sources of funding for the studies included in the review?</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
	<p>For Yes, <input type="checkbox"/> Must have reported on the sources of funding for individual studies included in the review (Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)</p>	
11*	<p>If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis</p>

Randomised controlled trials or randomised clinical trials:

For Yes:

Item		Scoring
	<input type="checkbox"/> The authors justified combining the data in a meta-analysis <input type="checkbox"/> AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present <input type="checkbox"/> AND investigated the causes of any heterogeneity conducted	
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? For Yes: <input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? For Yes: <input checked="" type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results (feasibility assessment, random effects model, sensitivity and sub-group analysis) AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? For Yes: <input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? For Yes: <input type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Albrecht *et al.* (2016) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input checked="" type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment <p>For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <ul style="list-style-type: none"> <input type="checkbox"/> justification for any deviations from the protocol 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p> <p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input type="checkbox"/> provided key word and/or search strategy <input type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For 'full' Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched the reference lists/bibliographies of included studies <input checked="" type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input checked="" type="checkbox"/> included/consulted experts in the field 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
5	<p>Did the review authors perform study selection in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6	<p>Did the review authors perform data extraction in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7*

Did the review authors provide a list of excluded studies and justify the exclusions?

- Yes
 Partial Yes
 No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8

Did the review authors describe the included studies in adequate detail?

- Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations,
- adequately described interventions,
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9*

Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:

- Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies

- Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies: N/A

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

N/A

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the AND discussed

the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	<p>If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
16	<p>Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Atif et al. (2024) – Quality assessment

Item		Scoring
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>For Yes to PICO:</p> <p><input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following:</p> <p><input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment</p> <p>For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified:</p> <p><input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <p><input checked="" type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

For Partial Yes (all of the following):

searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

provided key word and/or search strategy

justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

searched the reference lists/bibliographies of included studies

searched trial/study registries

where relevant, searched for grey literature

conducted search within 24 months of completion of the review

included/consulted experts in the field

5	Did the review authors perform study selection in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes, either ONE of the following:

at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include

OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6	Did the review authors perform data extraction in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
---	--	--

For Yes, either ONE of the following:

at least two reviewers achieved consensus on which data to extract from included studies

OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7*	Did the review authors provide a list of excluded studies and justify the exclusions?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
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For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8	Did the review authors describe the included studies in adequate detail?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
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For Partial Yes (ALL the following):

adequately described populations

adequately described interventions

described comparators

described outcomes

described research designs

For 'full' Yes, should also have ALL the following:

described study's setting

timeframe for follow-up

9*	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Randomised controlled trials or clinical trials: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes
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- No
- Includes only prospective cohort studies
- Non-randomised prospective cohort studies
- Yes
- Partial Yes
- No
- Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

- Yes
- No

For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

- Yes
- No
- No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
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For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Colvara *et al.* (2020) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes to PICO:

- Population

- Intervention
- Comparator
- Outcome
- Timeframe for follow-up

2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment <p>For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p> <p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input checked="" type="checkbox"/> provided key word and/or search strategy <input checked="" type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For 'full' Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input checked="" type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
5	<p>Did the review authors perform study selection in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6	<p>Did the review authors perform data extraction in duplicate?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7*

Did the review authors provide a list of excluded studies and justify the exclusions?

- Yes
- Partial Yes
- No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8

Did the review authors describe the included studies in adequate detail?

- Yes
- Partial Yes
- No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9*

Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

- Yes
- No

For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

- Yes
- No
- No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review

12

If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

- Yes
- No
- No meta-analysis

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*

Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?

- Yes
- No

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)

OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input checked="" type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes: <input checked="" type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input checked="" type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

Dadipoor *et al.* (2023) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
	For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified: <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol	

3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p> <p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input type="checkbox"/> provided key word and/or search strategy <input type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For ‘full’ Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
5	<p>Did the review authors perform study selection in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6	<p>Did the review authors perform data extraction in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies <input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7*	<p>Did the review authors provide a list of excluded studies and justify the exclusions?</p> <p>For Partial Yes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review <p>For ‘full’ Yes, must also have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> justified the exclusion from the review of each potentially relevant study 	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
8	<p>Did the review authors describe the included studies in adequate detail?</p> <p>For Partial Yes (ALL the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> adequately described populations <input type="checkbox"/> adequately described interventions <input type="checkbox"/> described comparators <input type="checkbox"/> described outcomes 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

- described research designs
- For 'full' Yes, should also have ALL the following:
 - described study's setting
 - timeframe for follow-up

9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p>	<p>Randomised controlled trials or clinical trials:</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> Partial Yes</p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Includes only prospective cohort studies</p> <p>Non-randomised prospective cohort studies</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Partial Yes</p> <p><input type="checkbox"/> No</p> <p><input checked="" type="checkbox"/> Includes only randomised controlled trials / clinical trials</p>
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(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	<p>Did the review authors report on the sources of funding for the studies included in the review?</p> <p>For Yes,</p> <p><input type="checkbox"/> Must have reported on the sources of funding for individual studies included in the review</p> <p>(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p>
11*	<p>If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p>

		<input type="checkbox"/> No meta-analysis
	<p>Randomised controlled trials or randomised clinical trials:</p> <p>For Yes:</p> <p><input type="checkbox"/> The authors justified combining the data in a meta-analysis</p> <p><input type="checkbox"/> AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present</p> <p><input type="checkbox"/> AND investigated the causes of any heterogeneity conducted</p> <p>Observational epidemiological studies prospective longitudinal studies:</p> <p>For Yes:</p> <p><input type="checkbox"/> The authors justified combining the data in a meta-analysis</p> <p><input type="checkbox"/> AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present</p> <p><input type="checkbox"/> AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available</p> <p><input type="checkbox"/> AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review</p>	
12	<p>If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?</p> <p>For Yes:</p> <p><input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
13*	<p>Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> included only low risk of bias RCTs in the review</p> <p><input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)</p> <p><input type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
14	<p>Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> There was no significant heterogeneity in the results</p> <p><input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
15*	<p>If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
16	<p>Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Faghihian *et al.* (2020) – Quality assessment

Item		Scoring
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>For Yes to PICO:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment <p>For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol 	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p> <p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input checked="" type="checkbox"/> provided key word and/or search strategy <input checked="" type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For 'full' Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No

- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No

Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

Yes
 No

For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

Yes
 No
 No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes: <input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)	
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input checked="" type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary	
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input checked="" type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes: <input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input checked="" type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

Gomersall *et al.* (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input checked="" type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
	For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following:	

- review question(s)
- a search strategy
- inclusion/exclusion criteria
- a risk of bias assessment

For 'full' Yes: **Protocol must be registered and accessible**

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3	Did the review authors explain their selection of the study designs for inclusion in the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4*	Did the review authors use a comprehensive literature search strategy?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
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For Partial Yes (all of the following):

- searched at least two databases (relevant to research question) (**Exclude if only one database was searched – fatal flaw**)
- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (**two or more** of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5	Did the review authors perform study selection in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6	Did the review authors perform data extraction in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7*	Did the review authors provide a list of excluded studies and justify the exclusions?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
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For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8

Did the review authors describe the included studies in adequate detail?

- Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations,
- adequately described interventions,
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9*

Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

- Yes
 No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

- Yes
 No
 No meta-analysis

Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
 AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
 AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
 AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
 AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
 AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12

If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

- Yes
 No
 No meta-analysis

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*

Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?

- Yes
 No

For Yes:

- included only low risk of bias RCTs in the review
 included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
 OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14

Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?

- Yes
 No

For Yes:

- There was no significant heterogeneity in the results
 OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*

If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?

- Yes
 No
 No meta-analysis

For Yes:

performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input checked="" type="checkbox"/> The authors reported no competing interests OR <input checked="" type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

Gurav *et al.* (2022) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input type="checkbox"/> Population <input type="checkbox"/> Intervention <input type="checkbox"/> Comparator <input type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered. For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified: <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	Did the review authors explain their selection of the study designs for inclusion in the review? For Yes, the review should satisfy ONE of the following: <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	Did the review authors use a comprehensive literature search strategy? For Partial Yes (all of the following): <input type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input type="checkbox"/> provided key word and/or search strategy <input type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

- For 'full' Yes (two or more of the following):
- searched the reference lists/bibliographies of included studies
 - searched trial/study registries
 - where relevant, searched for grey literature
 - conducted search within 24 months of completion of the review
 - included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes

No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes

No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes

Partial Yes

No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes

Partial Yes

No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Yes

Randomised controlled trials or clinical trials:

Partial Yes

No

Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

- Yes
- No

For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

- Yes
- No
- No meta-analysis

Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available

AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes: <input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)	
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	For Yes: <input type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary	
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes: <input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

He et al. (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

<p>The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes: The protocol must be reported as prepared and accessible</p> <p>The authors state that they had a written protocol or guide that included ALL the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> review question(s) <input checked="" type="checkbox"/> a search strategy <input checked="" type="checkbox"/> inclusion/exclusion criteria <input checked="" type="checkbox"/> a risk of bias assessment <p>For 'full' Yes: Protocol must be registered and accessible</p> <p>As for partial yes, plus the protocol should be registered and should also have specified:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input checked="" type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol 		
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p> <p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input checked="" type="checkbox"/> provided key word and/or search strategy <input checked="" type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For 'full' Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature <input checked="" type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
5	<p>Did the review authors perform study selection in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6	<p>Did the review authors perform data extraction in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies <input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7*	<p>Did the review authors provide a list of excluded studies and justify the exclusions?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes

No

For Partial Yes:
 provided a list of all potentially relevant studies that were read in full text form but excluded from the review
 For 'full' Yes, must also have:
 justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):
 adequately described populations,
 adequately described interventions
 described comparators
 described outcomes
 described research designs
 For 'full' Yes, should also have ALL the following:
 described study's setting
 timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:
 For Partial Yes, must have assessed RoB from
 unconcealed allocation AND
 lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)
 For 'full' Yes, must have assessed RoB from:
 allocation sequence that was not truly random (individual randomisation versus group randomization), AND
 selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting
 Non-randomised epidemiological studies:
 For Partial Yes, must have assessed RoB:
 from confounding, AND
 from selection bias
 For Yes, must also have assessed RoB:

	<input type="checkbox"/> methods used to ascertain exposures and outcomes, AND <input type="checkbox"/> selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting	
10	Did the review authors report on the sources of funding for the studies included in the review? For Yes, <input type="checkbox"/> Must have reported on the sources of funding for individual studies included in the review (Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Randomised controlled trials or randomised clinical trials: For Yes: <input checked="" type="checkbox"/> The authors justified combining the data in a meta-analysis <input checked="" type="checkbox"/> AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present <input type="checkbox"/> AND investigated the causes of any heterogeneity conducted Observational epidemiological studies prospective longitudinal studies: For Yes: <input type="checkbox"/> The authors justified combining the data in a meta-analysis <input type="checkbox"/> AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present <input type="checkbox"/> AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available <input type="checkbox"/> AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? For Yes: <input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? For Yes: <input type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input checked="" type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

15*	<p>If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
16	<p>Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?</p> <p>For Yes:</p> <p><input checked="" type="checkbox"/> The authors reported no competing interests OR</p> <p><input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Karande *et al.* (2023) – Quality assessment

Item		Scoring
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>For Yes to PICO:</p> <p><input checked="" type="checkbox"/> Population</p> <p><input checked="" type="checkbox"/> Intervention</p> <p><input checked="" type="checkbox"/> Comparator</p> <p><input checked="" type="checkbox"/> Outcome</p> <p><input checked="" type="checkbox"/> Timeframe for follow-up</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes:</p> <p>The protocol must be reported as prepared and accessible</p> <p>The authors state that they had a written protocol or guide that included ALL the following:</p> <p><input checked="" type="checkbox"/> review question(s)</p> <p><input checked="" type="checkbox"/> a search strategy</p> <p><input checked="" type="checkbox"/> inclusion/exclusion criteria</p> <p><input checked="" type="checkbox"/> a risk of bias assessment</p> <p>For 'full' Yes:</p> <p>Protocol must be registered and accessible</p> <p>As for partial yes, plus the protocol should be registered and should also have specified:</p> <p><input checked="" type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and</p> <p><input checked="" type="checkbox"/> a plan for investigating causes of heterogeneity</p> <p><input type="checkbox"/> justification for any deviations from the protocol</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <p><input type="checkbox"/> Explanation for including only RCTs</p> <p><input type="checkbox"/> OR Explanation for including only prospective cohort studies</p> <p><input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes

		<input type="checkbox"/> No
	<p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input checked="" type="checkbox"/> provided key word and/or search strategy <input checked="" type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For ‘full’ Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input checked="" type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field 	
5	<p>Did the review authors perform study selection in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6	<p>Did the review authors perform data extraction in duplicate?</p> <p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies <input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7*	<p>Did the review authors provide a list of excluded studies and justify the exclusions?</p> <p>For Partial Yes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review <p>For ‘full’ Yes, must also have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> justified the exclusion from the review of each potentially relevant study 	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
8	<p>Did the review authors describe the included studies in adequate detail?</p> <p>For Partial Yes (ALL the following):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> adequately described populations <input checked="" type="checkbox"/> adequately described interventions <input checked="" type="checkbox"/> described comparators <input checked="" type="checkbox"/> described outcomes <input checked="" type="checkbox"/> described research designs <p>For ‘full’ Yes, should also have ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> described study’s setting <input checked="" type="checkbox"/> timeframe for follow-up 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p>	<p>Randomised controlled trials or clinical trials:</p> <input checked="" type="checkbox"/> Yes

- Partial Yes
- No
- Includes only prospective cohort studies

- Non-randomised prospective cohort studies
- Yes
- Partial Yes
- No
- Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
----	--	--

For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Kim and Kim (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes to PICO:

- Population
- Intervention
- Comparator
- Outcome
- Timeframe for follow-up

2* Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
The protocol must be accessible to check that the parameters below are covered.

- Yes
- Partial Yes
- No

For Partial Yes:

The protocol must be reported as prepared and accessible

The authors state that they had a written protocol or guide that included ALL the following:

- review question(s)
- a search strategy
- inclusion/exclusion criteria
- a risk of bias assessment

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3 Did the review authors explain their selection of the study designs for inclusion in the review?

- Yes
- No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4* Did the review authors use a comprehensive literature search strategy?

- Yes
- Partial Yes
- No

For Partial Yes (all of the following):

- searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate?

- Yes
- No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include

OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6	Did the review authors perform data extraction in duplicate?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>For Yes, either ONE of the following:</p> <p><input type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies</p> <p><input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer</p>		
7*	Did the review authors provide a list of excluded studies and justify the exclusions?	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
<p>For Partial Yes:</p> <p><input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review</p> <p>For 'full' Yes, must also have:</p> <p><input type="checkbox"/> justified the exclusion from the review of each potentially relevant study</p>		
8	Did the review authors describe the included studies in adequate detail?	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
<p>For Partial Yes (ALL the following):</p> <p><input type="checkbox"/> adequately described populations</p> <p><input type="checkbox"/> adequately described interventions,</p> <p><input type="checkbox"/> described comparators</p> <p><input type="checkbox"/> described outcomes</p> <p><input type="checkbox"/> described research designs</p> <p>For 'full' Yes, should also have ALL the following:</p> <p><input type="checkbox"/> described study's setting</p> <p><input type="checkbox"/> timeframe for follow-up</p>		
9*	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	<p>Randomised controlled trials or clinical trials:</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> Partial Yes</p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Includes only prospective cohort studies</p> <p>Non-randomised prospective cohort studies</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> Partial Yes</p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Includes only randomised controlled trials / clinical trials</p>

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:
 For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
 - lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)
- For 'full' Yes, must have assessed RoB from:
- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
 - selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting
- Non-randomised epidemiological studies:
For Partial Yes, must have assessed RoB:
- from confounding, AND
 - from selection bias
- For Yes, must also have assessed RoB:
- methods used to ascertain exposures and outcomes, AND
 - selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10 Did the review authors report on the sources of funding for the studies included in the review? Yes No

- For Yes,
- Must have reported on the sources of funding for individual studies included in the review
- (Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11* If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Yes No No meta-analysis

- Randomised controlled trials or **randomised** clinical trials:
For Yes:
- The authors justified combining the data in a meta-analysis
 - AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
 - AND investigated the causes of any heterogeneity conducted
- Observational epidemiological studies prospective longitudinal studies:**
For Yes:
- The authors justified combining the data in a meta-analysis
 - AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
 - AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
 - AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12 If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? Yes No No meta-analysis

- For Yes:
- included only low risk of bias RCTs (sensitivity analysis)

13* Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? Yes No

- For Yes:
- included only low risk of bias RCTs in the review

- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	For Yes:	
	<input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
	For Yes:	
	<input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes:	
	<input type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

Mehta *et al.* (2025) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO:	
	<input type="checkbox"/> Population <input type="checkbox"/> Intervention <input type="checkbox"/> Comparator <input type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
	For Partial Yes:	
	The protocol must be reported as prepared and accessible	
	The authors state that they had a written protocol or guide that included ALL the following:	
	<input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment	
	For 'full' Yes:	
	Protocol must be registered and accessible	
	As for partial yes, plus the protocol should be registered and should also have specified:	

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3 Did the review authors explain their selection of the study designs for inclusion in the review? Yes No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4* Did the review authors use a comprehensive literature search strategy? Yes Partial Yes No

For Partial Yes (all of the following):

- searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw)
- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes Partial Yes No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8	<p>Did the review authors describe the included studies in adequate detail?</p> <p>For Partial Yes (ALL the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> adequately described populations <input type="checkbox"/> adequately described interventions, <input type="checkbox"/> described comparators <input type="checkbox"/> described outcomes <input type="checkbox"/> described research designs <p>For 'full' Yes, should also have ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> described study's setting <input type="checkbox"/> timeframe for follow-up 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p> <p>(Exclude if absent – fatal flaw)</p> <p>Randomised controlled trials or clinical trials: For Partial Yes, must have assessed RoB from</p> <ul style="list-style-type: none"> <input type="checkbox"/> unconcealed allocation AND <input type="checkbox"/> lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital) <p>For 'full' Yes, must have assessed RoB from:</p> <ul style="list-style-type: none"> <input type="checkbox"/> allocation sequence that was not truly random (individual randomisation versus group randomization), AND <input type="checkbox"/> selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting <p>Non-randomised epidemiological studies: For Partial Yes, must have assessed RoB:</p> <ul style="list-style-type: none"> <input type="checkbox"/> from confounding, AND <input type="checkbox"/> from selection bias <p>For Yes, must also have assessed RoB:</p> <ul style="list-style-type: none"> <input type="checkbox"/> methods used to ascertain exposures and outcomes, AND <input type="checkbox"/> selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting 	<p>Randomised controlled trials or clinical trials:</p> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input type="checkbox"/> Includes only prospective cohort studies <p>Non-randomised prospective cohort studies</p> <input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Includes only randomised controlled trials / clinical trials
10	<p>Did the review authors report on the sources of funding for the studies included in the review?</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
-----	---	---

Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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		<input type="checkbox"/> No meta-analysis
	For Yes: <input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes: <input type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	

Nazari *et al.* (2025) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input type="checkbox"/> Population <input type="checkbox"/> Intervention <input type="checkbox"/> Comparator <input type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered. For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified: <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	Did the review authors explain their selection of the study designs for inclusion in the review? For Yes, the review should satisfy ONE of the following: <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	Did the review authors use a comprehensive literature search strategy? For Partial Yes (all of the following):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

searched at least two databases
(relevant to research question) (Exclude if only one database was searched – fatal flaw)

provided key word and/or search strategy
 justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

searched the reference lists/bibliographies of included studies
 searched trial/study registries
 where relevant, searched for grey literature
 conducted search within 24 months of completion of the review
 included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
 OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

at least two reviewers achieved consensus on which data to extract from included studies
 OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

adequately described populations
 adequately described interventions,
 described comparators
 described outcomes
 described research designs

For 'full' Yes, should also have ALL the following:

described study's setting
 timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No

Includes only prospective cohort studies

Non-randomised prospective cohort studies

Yes

Partial Yes

No

Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

unconcealed allocation AND

lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

from confounding, AND

from selection bias

For Yes, must also have assessed RoB:

methods used to ascertain exposures and outcomes, AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10 Did the review authors report on the sources of funding for the studies included in the review? Yes No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11* If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Yes No No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

The authors justified combining the data in a meta-analysis

AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present

AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
----	--	--

For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Priya et al. (2019) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes to PICO:

- Population
- Intervention
- Comparator
- Outcome
- Timeframe for follow-up

2*

Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
The protocol must be accessible to check that the parameters below are covered.

- Yes
- Partial Yes
- No

For Partial Yes:

The protocol must be reported as prepared and accessible

The authors state that they had a written protocol or guide that included ALL the following:

- review question(s)
- a search strategy
- inclusion/exclusion criteria
- a risk of bias assessment

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3

Did the review authors explain their selection of the study designs for inclusion in the review?

- Yes
- No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4*

Did the review authors use a comprehensive literature search strategy?

- Yes
- Partial Yes
- No

For Partial Yes (all of the following):

- searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5

Did the review authors perform study selection in duplicate?

- Yes
- No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include

OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

at least two reviewers achieved consensus on which data to extract from included studies

OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

adequately described populations,

adequately described interventions

described comparators

described outcomes

described research designs

For 'full' Yes, should also have ALL the following:

described study's setting

timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

unconcealed AND

lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting (

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

from confounding, AND

from selection bias

For Yes, must also have assessed RoB:

methods used to ascertain exposures and outcomes, AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10 Did the review authors report on the sources of funding for the studies included in the review? Yes No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11* If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Yes No No meta-analysis

Randomised controlled trials or **randomised** clinical trials:

For Yes:

The authors justified combining the data in a meta-analysis

AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present

AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

The authors justified combining the data in a meta-analysis

AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present

AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available

AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12 If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? Yes No No meta-analysis

For Yes:

included only low risk of bias RCTs (sensitivity analysis)

13* Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? Yes No

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Salazar *et al.* (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO:	
	<input checked="" type="checkbox"/> Population	
	<input checked="" type="checkbox"/> Intervention	
	<input checked="" type="checkbox"/> Comparator	
	<input checked="" type="checkbox"/> Outcome	
	<input type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
	For Partial Yes:	
	The protocol must be reported as prepared and accessible	
	The authors state that they had a written protocol or guide that included ALL the following:	
	<input checked="" type="checkbox"/> review question(s)	
	<input checked="" type="checkbox"/> a search strategy	
	<input checked="" type="checkbox"/> inclusion/exclusion criteria	
	<input checked="" type="checkbox"/> a risk of bias assessment	

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3 Did the review authors explain their selection of the study designs for inclusion in the review? Yes No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4* Did the review authors use a comprehensive literature search strategy? Yes Partial Yes No

For Partial Yes (all of the following):

searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes Partial Yes No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes

- Partial Yes
- No

For Partial Yes (ALL the following):

- adequately described populations,
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9*

Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

- Yes
- No

For Yes,

Must have reported on the sources of funding for individual studies included in the review
 (Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
----	--	--

For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16 Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? Yes No

For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Saxena *et al.* (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered. For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input type="checkbox"/> review question(s) <input type="checkbox"/> a search strategy <input type="checkbox"/> inclusion/exclusion criteria <input type="checkbox"/> a risk of bias assessment For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified: <input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	Did the review authors explain their selection of the study designs for inclusion in the review? For Yes, the review should satisfy ONE of the following: <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4*	Did the review authors use a comprehensive literature search strategy? For Partial Yes (all of the following): <input type="checkbox"/> searched at least two databases	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations,
- adequately described interventions,
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No

Includes only prospective cohort studies

Non-randomised prospective cohort studies

Yes

Partial Yes

No

Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

unconcealed allocation AND

lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

from confounding, AND

from selection bias

For Yes, must also have assessed RoB:

methods used to ascertain exposures and outcomes, AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

Yes

No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

Yes

No

No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

The authors justified combining the data in a meta-analysis

AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present

AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Shakir *et al.* (2021) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes to PICO:

- Population
- Intervention
- Comparator
- Outcome
- Timeframe for follow-up

2*

Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
The protocol must be accessible to check that the parameters below are covered.

- Yes
- Partial Yes
- No

For Partial Yes:

The protocol must be reported as prepared and accessible

The authors state that they had a written protocol or guide that included ALL the following:

- review question(s)
- a search strategy
- inclusion/exclusion criteria
- a risk of bias assessment

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3

Did the review authors explain their selection of the study designs for inclusion in the review?

- Yes
- No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4*

Did the review authors use a comprehensive literature search strategy?

- Yes
- Partial Yes
- No

For Partial Yes (all of the following):

- searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5

Did the review authors perform study selection in duplicate?

- Yes
- No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include

OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6	<p>Did the review authors perform data extraction in duplicate?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<p>For Yes, either ONE of the following:</p> <p><input checked="" type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies</p> <p><input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer</p>		
7*	<p>Did the review authors provide a list of excluded studies and justify the exclusions?</p>	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
<p>For Partial Yes:</p> <p><input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review</p> <p>For 'full' Yes, must also have:</p> <p><input type="checkbox"/> justified the exclusion from the review of each potentially relevant study</p>		
8	<p>Did the review authors describe the included studies in adequate detail?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
<p>For Partial Yes (ALL the following):</p> <p><input checked="" type="checkbox"/> adequately described populations</p> <p><input checked="" type="checkbox"/> adequately described interventions</p> <p><input checked="" type="checkbox"/> described comparators</p> <p><input checked="" type="checkbox"/> described outcomes</p> <p><input checked="" type="checkbox"/> described research designs</p> <p>For 'full' Yes, should also have ALL the following:</p> <p><input checked="" type="checkbox"/> described study's setting</p> <p><input checked="" type="checkbox"/> timeframe for follow-up</p>		
9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p>	<p>Randomised controlled trials or clinical trials:</p> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input type="checkbox"/> Includes only prospective cohort studies <p>Non-randomised prospective cohort studies</p> <input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input type="checkbox"/> Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:
 For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
 - lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)
- For 'full' Yes, must have assessed RoB from:
- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
 - selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
----	---	--

For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
-----	---	---

Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Stein *et al.* (2018) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	For Yes to PICO:	
	<input checked="" type="checkbox"/> Population	
	<input checked="" type="checkbox"/> Intervention	
	<input checked="" type="checkbox"/> Comparator	
	<input checked="" type="checkbox"/> Outcome	
	<input type="checkbox"/> Timeframe for follow-up	
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
	For Partial Yes:	
	The protocol must be reported as prepared and accessible	
	The authors state that they had a written protocol or guide that included ALL the following:	
	<input type="checkbox"/> review question(s)	
	<input type="checkbox"/> a search strategy	
	<input type="checkbox"/> inclusion/exclusion criteria	
	<input type="checkbox"/> a risk of bias assessment	

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3 Did the review authors explain their selection of the study designs for inclusion in the review? Yes No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4* Did the review authors use a comprehensive literature search strategy? Yes Partial Yes No

For Partial Yes (all of the following):

searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes Partial Yes No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes

Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9*	<p>Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</p>	<p>Randomised controlled trials or clinical trials: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input type="checkbox"/> Includes only prospective cohort studies</p> <p>Non-randomised prospective cohort studies <input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Includes only randomised controlled trials / clinical trials</p>
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(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	<p>Did the review authors report on the sources of funding for the studies included in the review?</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
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For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

- Yes
 No
 No meta-analysis

Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
 AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
 AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
 AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
 AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
 AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12

If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

- Yes
 No
 No meta-analysis

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*

Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?

- Yes
 No

For Yes:

- included only low risk of bias RCTs in the review
 included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
 OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14

Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?

- Yes
 No

For Yes:

- There was no significant heterogeneity in the results
 OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*

If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?

- Yes
 No
 No meta-analysis

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16 Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? Yes No

For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Tsai *et al.* (2020) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered. For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input checked="" type="checkbox"/> review question(s) <input checked="" type="checkbox"/> a search strategy <input checked="" type="checkbox"/> inclusion/exclusion criteria <input checked="" type="checkbox"/> a risk of bias assessment For 'full' Yes: Protocol must be registered and accessible As for partial yes, plus the protocol should be registered and should also have specified: <input checked="" type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and <input type="checkbox"/> a plan for investigating causes of heterogeneity <input type="checkbox"/> justification for any deviations from the protocol	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	Did the review authors explain their selection of the study designs for inclusion in the review? For Yes, the review should satisfy ONE of the following: <input type="checkbox"/> Explanation for including only RCTs <input type="checkbox"/> OR Explanation for including only prospective cohort studies <input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4*	Did the review authors use a comprehensive literature search strategy? For Partial Yes (all of the following): <input checked="" type="checkbox"/> searched at least two databases	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

- justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations
- adequately described interventions
- described comparators
- described outcomes
- described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
- timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No

Includes only prospective cohort studies

Non-randomised prospective cohort studies

Yes

Partial Yes

No

Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

unconcealed allocation AND

lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

allocation sequence that was not truly random (individual randomisation versus group randomization), AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

from confounding, AND

from selection bias

For Yes, must also have assessed RoB:

methods used to ascertain exposures and outcomes, AND

selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10

Did the review authors report on the sources of funding for the studies included in the review?

Yes

No

For Yes,

Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*

If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

Yes

No

No meta-analysis

Randomised controlled trials or randomised clinical trials:

For Yes:

The authors justified combining the data in a meta-analysis

AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present

AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
-----	--	--

For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
----	--	--

For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review **and the quality of evidence**

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
-----	--	---

For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
----	---	--

For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

von Helde *et al.* (2024) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

For Yes to PICO:

- Population
- Intervention
- Comparator
- Outcome
- Timeframe for follow-up

2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered.</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
----	--	--

For Partial Yes:

The protocol must be reported as prepared and accessible

The authors state that they had a written protocol or guide that included

ALL the following:

- review question(s)
- a search strategy
- inclusion/exclusion criteria
- a risk of bias assessment

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
---	---	--

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4*	<p>Did the review authors use a comprehensive literature search strategy?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
----	---	--

For Partial Yes (all of the following):

- searched at least two databases

(relevant to research question) (Exclude if only one database was searched – fatal flaw)

- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5	<p>Did the review authors perform study selection in duplicate?</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
---	---	--

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include

OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

at least two reviewers achieved consensus on which data to extract from included studies

OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail? Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

adequately described populations

adequately described interventions

described comparators

described outcomes

described research designs

For 'full' Yes, should also have ALL the following:

described study's setting

timeframe for follow-up

9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
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Randomised controlled trials or **randomised** clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary **effect** estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
----	--	---

For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? For Yes: <input type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input checked="" type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? For Yes: <input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No meta-analysis
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? For Yes: <input checked="" type="checkbox"/> The authors reported no competing interests OR <input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Xiang *et al.* (2020) – Quality assessment

Item		Scoring
1	Did the research questions and inclusion criteria for the review include the components of PICO? For Yes to PICO: <input checked="" type="checkbox"/> Population <input checked="" type="checkbox"/> Intervention <input checked="" type="checkbox"/> Comparator <input checked="" type="checkbox"/> Outcome <input type="checkbox"/> Timeframe for follow-up	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? The protocol must be accessible to check that the parameters below are covered. For Partial Yes: The protocol must be reported as prepared and accessible The authors state that they had a written protocol or guide that included ALL the following: <input checked="" type="checkbox"/> review question(s) <input checked="" type="checkbox"/> a search strategy <input checked="" type="checkbox"/> inclusion/exclusion criteria	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No

a risk of bias assessment

For 'full' Yes:

Protocol must be registered and accessible

As for partial yes, plus the protocol should be registered and should also have specified:

- a meta-analysis/synthesis plan, if appropriate, and
- a plan for investigating causes of heterogeneity
- justification for any deviations from the protocol

3 Did the review authors explain their selection of the study designs for inclusion in the review? Yes
 No

For Yes, the review should satisfy ONE of the following:

- Explanation for including only RCTs
- OR Explanation for including only prospective cohort studies
- OR Explanation for including both RCTs and prospective cohort studies

4* Did the review authors use a comprehensive literature search strategy? Yes
 Partial Yes
 No

For Partial Yes (all of the following):

- searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw)
- provided key word and/or search strategy
- justified publication restrictions (e.g., language and/or duration of search)

For 'full' Yes (two or more of the following):

- searched the reference lists/bibliographies of included studies
- searched trial/study registries
- where relevant, searched for grey literature
- conducted search within 24 months of completion of the review
- included/consulted experts in the field

5 Did the review authors perform study selection in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer

6 Did the review authors perform data extraction in duplicate? Yes
 No

For Yes, either ONE of the following:

- at least two reviewers achieved consensus on which data to extract from included studies
- OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer

7* Did the review authors provide a list of excluded studies and justify the exclusions? Yes
 Partial Yes
 No

For Partial Yes:

- provided a list of all potentially relevant studies that were read in full text form but excluded from the review

For 'full' Yes, must also have:

justified the exclusion from the review of each potentially relevant study

8 Did the review authors describe the included studies in adequate detail?

- Yes
 Partial Yes
 No

For Partial Yes (ALL the following):

- adequately described populations
 adequately described interventions
 described comparators
 described outcomes
 described research designs

For 'full' Yes, should also have ALL the following:

- described study's setting
 timeframe for follow-up

9*

Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

Randomised controlled trials or clinical trials:
 Yes
 Partial Yes
 No
 Includes only prospective cohort studies

Non-randomised prospective cohort studies
 Yes
 Partial Yes
 No
 Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
 lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
 selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
 from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
 selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>For Yes,</p> <input type="checkbox"/> Must have reported on the sources of funding for individual studies included in the review (Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)		
11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
<p>Randomised controlled trials or randomised clinical trials: For Yes: <input checked="" type="checkbox"/> The authors justified combining the data in a meta-analysis <input checked="" type="checkbox"/> AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present <input type="checkbox"/> AND investigated the causes of any heterogeneity conducted</p> <p>Observational epidemiological studies prospective longitudinal studies: For Yes: <input type="checkbox"/> The authors justified combining the data in a meta-analysis <input type="checkbox"/> AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present <input type="checkbox"/> AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available <input type="checkbox"/> AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review</p>		
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
<p>For Yes: <input type="checkbox"/> included only low risk of bias RCTs (sensitivity analysis)</p>		
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>For Yes: <input type="checkbox"/> included only low risk of bias RCTs in the review <input type="checkbox"/> included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences) <input type="checkbox"/> OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary</p>		
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>For Yes: <input type="checkbox"/> There was no significant heterogeneity in the results <input type="checkbox"/> OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence</p>		

15*	<p>If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?</p> <p>For Yes:</p> <p><input type="checkbox"/> performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
16	<p>Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?</p> <p>For Yes:</p> <p><input checked="" type="checkbox"/> The authors reported no competing interests OR</p> <p><input type="checkbox"/> The authors described their funding sources and how they managed potential conflicts of interest</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Xiang *et al.* (2021) – Quality assessment

Item		Scoring
1	<p>Did the research questions and inclusion criteria for the review include the components of PICO?</p> <p>For Yes to PICO:</p> <p><input type="checkbox"/> Population</p> <p><input type="checkbox"/> Intervention</p> <p><input type="checkbox"/> Comparator</p> <p><input type="checkbox"/> Outcome</p> <p><input type="checkbox"/> Timeframe for follow-up</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2*	<p>Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?</p> <p>The protocol must be accessible to check that the parameters below are covered.</p> <p>For Partial Yes:</p> <p>The protocol must be reported as prepared and accessible</p> <p>The authors state that they had a written protocol or guide that included ALL the following:</p> <p><input type="checkbox"/> review question(s)</p> <p><input type="checkbox"/> a search strategy</p> <p><input type="checkbox"/> inclusion/exclusion criteria</p> <p><input type="checkbox"/> a risk of bias assessment</p> <p>For 'full' Yes:</p> <p>Protocol must be registered and accessible</p> <p>As for partial yes, plus the protocol should be registered and should also have specified:</p> <p><input type="checkbox"/> a meta-analysis/synthesis plan, if appropriate, and</p> <p><input type="checkbox"/> a plan for investigating causes of heterogeneity</p> <p><input type="checkbox"/> justification for any deviations from the protocol</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input type="checkbox"/> No
3	<p>Did the review authors explain their selection of the study designs for inclusion in the review?</p> <p>For Yes, the review should satisfy ONE of the following:</p> <p><input checked="" type="checkbox"/> Explanation for including only RCTs</p> <p><input type="checkbox"/> OR Explanation for including only prospective cohort studies</p> <p><input type="checkbox"/> OR Explanation for including both RCTs and prospective cohort studies</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4*	<p>Did the review authors use a comprehensive literature search strategy?</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes

		<input type="checkbox"/> No
	<p>For Partial Yes (all of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched at least two databases (relevant to research question) (Exclude if only one database was searched – fatal flaw) <input type="checkbox"/> provided key word and/or search strategy <input type="checkbox"/> justified publication restrictions (e.g., language and/or duration of search) <p>For ‘full’ Yes (two or more of the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> searched the reference lists/bibliographies of included studies <input type="checkbox"/> searched trial/study registries <input type="checkbox"/> where relevant, searched for grey literature <input type="checkbox"/> conducted search within 24 months of completion of the review <input type="checkbox"/> included/consulted experts in the field 	
5	Did the review authors perform study selection in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include <input type="checkbox"/> OR two reviewers selected a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer 	
6	Did the review authors perform data extraction in duplicate?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<p>For Yes, either ONE of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> at least two reviewers achieved consensus on which data to extract from included studies <input type="checkbox"/> OR two reviewers extracted data from a sample of eligible studies AND achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer 	
7*	Did the review authors provide a list of excluded studies and justify the exclusions?	<input type="checkbox"/> Yes <input type="checkbox"/> Partial Yes <input checked="" type="checkbox"/> No
	<p>For Partial Yes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> provided a list of all potentially relevant studies that were read in full text form but excluded from the review <p>For ‘full’ Yes, must also have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> justified the exclusion from the review of each potentially relevant study 	
8	Did the review authors describe the included studies in adequate detail?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Partial Yes <input type="checkbox"/> No
	<p>For Partial Yes (ALL the following):</p> <ul style="list-style-type: none"> <input type="checkbox"/> adequately described populations <input type="checkbox"/> adequately described interventions <input type="checkbox"/> described comparators <input type="checkbox"/> described outcomes <input type="checkbox"/> described research designs <p>For ‘full’ Yes, should also have ALL the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> described study’s setting <input type="checkbox"/> timeframe for follow-up 	
9*	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Randomised controlled trials or clinical trials: <input checked="" type="checkbox"/> Yes

- Partial Yes
- No
- Includes only prospective cohort studies

- Non-randomised prospective cohort studies
- Yes
- Partial Yes
- No
- Includes only randomised controlled trials / clinical trials

(Exclude if absent – fatal flaw)

Randomised controlled trials or clinical trials:

For Partial Yes, must have assessed RoB from

- unconcealed allocation AND
- lack of blinding assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality or admission to hospital)

For 'full' Yes, must have assessed RoB from:

- allocation sequence that was not truly random (individual randomisation versus group randomization), AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

Non-randomised epidemiological studies:

For Partial Yes, must have assessed RoB:

- from confounding, AND
- from selection bias

For Yes, must also have assessed RoB:

- methods used to ascertain exposures and outcomes, AND
- selection of the reported result from among multiple measurements or analyses of a specified outcome, known as selective reporting

10	Did the review authors report on the sources of funding for the studies included in the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes,

- Must have reported on the sources of funding for individual studies included in the review

(Note: Reporting that the reviewers looked for this information, but it was not reported by study authors also qualifies)

11*	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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Randomised controlled trials or randomised clinical trials:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present
- AND investigated the causes of any heterogeneity conducted

Observational epidemiological studies prospective longitudinal studies:

For Yes:

- The authors justified combining the data in a meta-analysis
- AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
- AND they statistically combined effect estimates from prospective cohort studies that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
- AND they reported separate summary effect estimates for RCTs and prospective cohort studies separately when both were included in the review

12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- included only low risk of bias RCTs (sensitivity analysis)

13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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For Yes:

- included only low risk of bias RCTs in the review
- included only low risk of bias RCTs (in meta-analysis or a sensitivity analysis and discuss differences)
- OR, if RCTs with moderate or high RoB, or prospective cohort studies were included the review provided a discussion of the likely impact of RoB on the results and quality of evidence or limitations in conclusions or summary

14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- There was no significant heterogeneity in the results
- OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results AND discussed the impact of this heterogeneity on the results of the review and the quality of evidence

15*	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No meta-analysis
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For Yes:

- performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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For Yes:

- The authors reported no competing interests OR
- The authors described their funding sources and how they managed potential conflicts of interest

Appendix F Characteristics of included systematic reviews

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Maternal and early childhood											
Abuhaloob et al. (2019)	Are there any trials assessing the effectiveness of maternal and/or child oral health intervention in MENA (middle east and north Africa) countries and, if so, what are the most effective interventions?	Day-care centres and integrated maternal services	Iran	332 pairs of mother and child (under age 5 years)	Simple OHE - pamphlet, verbal instruction, reminders	No oral health promotion	Reduction in new early childhood dental caries; Improvement in oral health behaviours of mothers.	3 – 6 months	2 cRCTs	2009 - 2015	Primary-care staff; Vaccination staff.
Colvara et al. (2020)	To assess whether motivational interviewing is effective in the prevention of early	Not specified	Australia, Brazil, Canada, India, Iran, Thailand, USA	4337 children aged 0 – 6 years	Theory-based OHE - Motivational Interviewing or counselling techniques	Any type of other oral health education or negative controls	Reduction in new dental caries lesions.	3 months – 3 years	10 RCTs	2004 - 2019	MI trained local people, community therapists, dental hygienists, dentists,

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
	childhood caries										unspecified counsellors.
Faghihian et al. (2020)	To evaluate the effectiveness of an MI-based intervention for parents on the clinical reduction of ECC	Not specified	Brazil, Canada, India, USA	3016 parents and caregivers of children up to 6 years	MI-based oral health education with pamphlets, video, dvd, treatment recommendations and aids	Traditional dental health education	No difference in rates of early childhood caries; More effective in controlling dental caries.	8 – 24 months	8 RCTs	2004 - 2018	MI trained local people; researcher; dental assistants; dentists.
Gomersall et al. (2024)	The effects of interventions targeted at pregnant women, new mothers or other primary caregivers of infants in the first year of life, for preventing ECC	Not specified	Australia, Belarus, Brazil, Canada, Finland, Hong Kong, Uganda, UK, USA	23,973 pregnant women and new mothers of young infants (up to 12 months)	Simple OHE - support for breastfeeding, dietary advice and counselling, with or without oral hygiene education and reinforcement	Standard care or another intervention for preventing ECC	Little to no difference in prevention of ECC; diet and feeding practice advice may slightly reduce risk.	6 months – 6 years	5 cRCTs and 9 RCTs	1995 - 2021	Infant feeding trained healthcare workers; breastfeeding and nutrition trained local volunteers; dietitians; Post-natal team; nutrition education team; dental practitioners; dental hygienists; paediatrician

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Karande et al. (2023)	Is there a difference in the effect of MI and the traditional method of oral health education given to mothers on oral health outcomes and behaviour changes of their children?	Not specified	Brazil, India, Iran, Mexico, Thailand, USA	2786 mothers and children	MI-based oral health education	Traditional OHE method including oral health talk or oral health counselling	Incidence of dental caries was less in MI-based intervention groups	3 months – 3 years	7 RCTs	2006 - 2018	and family physician. Dental health professionals.
Saxena et al. (2024)	Can educational programmes on oral health for mothers effectively reduce the occurrence of ECC in their children?	Not specified	Australia, Brazil, Canada, India, Iran, Uganda	2591 pre- and postnatal mothers	Simple OHE for mothers: posters, templates, targeted nutrition education, one-to-one education session, pamphlets,	Control	Reduced risk of ECC the in maternal education groups	When children were aged 2 – 6 years	3 cRCTs and 5 RCTs	2008 - 2022	Nurses; physicians; administrative staff; nutrition education teams; community health representatives.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
					verbal information						
von Helde et al. (2024)	Are educational tools in oral health programmes for pregnant women effective in improving the oral health of mothers and their babies up to 2 years old?	Not specified	Australia, China, Iran, USA	1972 pregnant women and their babies up to 2 years of age	Simple OHE - lectures, group sessions, face-to-face, social media messages, conversations, posters, interactive online chats, information leaflets, scripted telephone calls, individual MI guidance	Standard or routine care or no intervention	May reduce risk of ECC in primary teeth	Up to 24 months postpartum	3 RCTs and 3 NRS	2008 - 2022	Dentists; nurses; professional health service providers.

Children and adolescents

Atif et al. (2024)	What is the effectiveness of various methods of educating children and adolescents for maintenance of oral health?	School-based	India, Iran, Greece, Jordan, Syria, Turkey	1926 children aged 4 – 15 years	OHE and training modalities - broadly categorised into seven types	No educational intervention or traditional information or no additional instruction	Improvement in oral health and hygiene	12 weeks - 18 months	2 cRCTs and 8 RCTs	2009 - 2022	School and kindergarten personnel; researchers; dentists; teachers.
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Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Dadipoor et al. (2023)	To assess the effects of oral health intervention programs at school level on students' oral hygiene in developing countries	School-based	India, Iran, Pakistan, Taiwan, Uzbekistan	2838 primary, middle, and high school children	OHE - lectures, multi-media, audio-visual aids, pamphlets, role-play, demonstrations	Control	Improved oral health status and behaviours	1 – 9 months	4 cRCTs, 5 RCTs, and 3 quasi-experimental	2009 – 2018	Dentists; teachers; peers.
Gurav et al. (2022)	In school children aged 5–16 years are the newer oral health educational methods as compared to traditional oral health talk effective in improving oral hygiene status, plaque and gingival status, and dental caries status?	Not specified	Greece, India, Syria	1100 children aged 5–16 years	OHE - demos/videos/posters/presentations/activities/instructions	Traditional OHE	no statistically significant improvement in oral health status	1-18 months	1 cRCTs, 7 RCTs, and 1 clinical trial	2012 - 2018	Dental health professionals.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
He et al. (2024)	Are interventions based on psychological theories or models better than conventional oral health education or negative control in improving oral health among adolescents?	School or clinic setting	Hong Kong, Iran, Lithuania, Sweden	5540 adolescents 12-18 years	Theory-based OHE – behavioural counselling (person-centred, individualised, one-to-one), peer-led interactive, social media, leaflets, action planning, hands-on practice	Conventional OHE or no intervention	Improved oral hygiene and periodontal status	2 weeks – 24 months	9 cRCTs, 3 RCTs, and 1 quasi-randomised trial	2012 - 2024	Dental hygienist; dental professionals; dentists; peers; researchers; parents.
Kim and Kim (2024)	To review and assess the effectiveness of school-based oral health education programs in low-income and middle-income countries	School-based	Brazil, China, India, Iran, Pakistan, Tanzania, Thailand, Zimbabwe	11,096 school-age children and adolescents	OHE - lectures, practical demonstrations and hands-on sessions	No OHE or received only one-shot education	Significant improvement in oral health status	1 month – 8 years	16 RCTs, 4 NRS	2000 - 2016	Dentists; health professionals; health education specialists; teachers; peers; researcher.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Nazari et al. (2025)	To assess the effectiveness of theory-based health education and promotion interventions in impacting oral health outcomes among children and adolescents	Not reported	Hong Kong, Iran, Lithuania, Pakistan, Thailand	6560 children and adolescents aged 5 – 18 years	Theory-based OHE - monthly reinforcements, lectures, role-play, puzzles, group discussion, demos, hands-on practice, one-to-one counselling, social media, apps	Control – not reported	Improved oral health behaviour and oral health-related quality of life Unclear data not included in current synthesis	1 – 12 months	9 cRCTs and 10 RCTs	2012 - 2024	Dentists; teachers; peers.
Priya et al. (2019)	Effectiveness of school dental health education on the oral health-related knowledge, attitude, and practice behaviour and oral health status of 6–12-year-old children	School-based	Belgium, China, England, Finland, Greece, India, Iraq, Pakistan, Taiwan, UK, USA	14,698 school children aged 6 – 12 years	OHE - lessons, leaflets, dental hygiene aids, instruction, videos, presentations, posters, plays, demonstrations, question-answer sessions, supervised practice, role play	No intervention or traditional learning	Increased duration and practice of toothbrushing and improved diet	6 months – 10 years	2 cRCTs, 3 RCTs and 6 NRS	1982 - 2017	Dentists; dental hygienists; dental facilitators; dental nurses; teachers; peers.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Shakir <i>et al.</i> (2021)	To evaluate the effectiveness of school-based behavioural interventions (with or without environmental elements such as daily supervised toothbrushing) in improving children’s oral health	School-based	Finland, Germany, India, Iran, Pakistan, Taiwan	5225 children aged 3 – 18 years	OHE - behavioural interventions related to sugar intake and oral hygiene - booklets, posters, demos, role-play, hands-on practice, instruction, puzzles, diaries, interactive learning aids, group discussion and contests	Standard health education or no intervention	Little or no change in presence of dental caries; reduction in plaque scores and improved gingival health; some improvement in self-reported behaviours	1 month – 2 years	8 cRCTs	2009 - 2019	Dentists; teachers; peers; school health coaches; parents; community organisations.
Stein <i>et al.</i> (2018)	To evaluate the effectiveness of oral health educational actions in the school context on improving oral hygiene and dental caries in schoolchildren	School-based	Brazil, England, Finland, India, Iran, Jordan, Pakistan, Yugoslavia	3932 school children 6 – 15 years	OHE programmes - lectures, albums, slides, leaflets, counselling, games, drawings, theatre, dieting guidance; oral health instruction:	No educational programme	Some improvement in oral health status, mixed effect on presence of dental caries, favourable changes in diet in intervention groups	1 month – 4 years	12 RCTs	1996 - 2014	Dental professionals – dentists, dental hygienists, researcher.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
					toothbrushing/supervised toothbrushing						
Tsai et al. (2020)	To evaluate the effectiveness of community oral health interventions in improving the knowledge, behaviour and/or oral health status of healthy adolescents	School or clinic setting	Brazil, England, Finland, India, Iran, Lithuania, Pakistan, Romania, Sweden, Tanzania, USA, Uzbekistan, Yugoslavia	12,491 adolescents aged 10-18 years with no co-morbidities	OHE – family and parental involvement, dental take-home products, behaviour change counselling, instruction, practice guidance and training, visual aids, demos, group discussion, leaflets/video	Conventional or traditional OHE or no intervention	Significant improvement in oral health status	1 month – 3 years	14 cRCTs, 10 RCTs	1992 - 2019	Dentists; dental hygienists; dental auxiliaries; researchers; health education specialists; teachers; peers.
Xiang et al. (2020)	To examine the effectiveness of behavioural interventions at different follow-up periods to improve	Not specified but all were conducted in schools	Brazil, China, England, Finland, India, Iran, Lithuania, Pakistan, Sri Lanka, USA, Yugoslavia	8124 adolescents aged 10 – 16 years	OHE behavioural interventions - presentations, posters, booklets, demos, instruction, counselling, question-answer session,	No intervention or negative comparator	No significant difference in the short term; improved oral health status in the longer term with reminders; improved oral health	2 weeks – 3 years	16 cRCTs, 1 RCT	1985 - 2017	Dentists; dental facilitators; teachers; peers, self-learning.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
	adolescents' oral health				group activities, reinforcements, audio-visual aids, hands-on practice, videos, role-play		practice behaviours				
Xiang <i>et al.</i> (2021)	To analyse the efficacy of theory-guided interventions on clinical oral health outcomes and oral health behaviours	Not specified	Iran, Lithuania, Pakistan, Thailand	Unclear	Theory-based OHE – face-to-face, multicomponent, pamphlets, posters, instructions, group activities	No intervention or regular curriculum-based health education programme	Unclear	2 weeks – 2 years	7 or 9 RCTs	2012 - 2017	Dentists; health education specialists; teachers; school staff; peers; parents.
Older adults											
Albrecht <i>et al.</i> (2016)	To assess the effects of oral health educational interventions for nursing home staff or residents, or both, to maintain or improve residents' oral health	Nursing homes or long-term care facilities	Belgium, Canada, Germany, the Netherlands, Scotland, Switzerland, UK	3253 residents aged 78-86 years	OHE programmes (information only or information and practical skills training and monitoring) direct-to-staff, direct-to-resident, or a combination of both	Usual care	No evidence of meaningful effects of educational interventions on any measure of residents' oral health	3 months – 5 years	7 cRCTs, 2 RCTs	1989 – 2013	Dentists; dental hygienists; trained nursing staff; health promoters; occupational therapists.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
Mehta et al. (2025)	What is the effectiveness of caregiver training and oral health education programmes on the oral health outcomes of institutionalised older adults, particularly in terms of denture hygiene and dental plaque levels?	Institutional settings like nursing homes, residential facilities, rehabilitation centres, care homes	Belgium, Canada, China, Finland, Germany, India, the Netherlands, UK, USA	5559 institutionalised older adults	OHE or training of caregivers by health care/para-health care professionals	No active oral health intervention/usual or routine care	Significantly improved oral health status	2 weeks – 5 years	7 cRCTs, 4 RCTs	2001 - 2021	Dentists; dental hygienists; nurse educators; health promoters; registered nurses; researchers.
Salazar et al. (2024)	Assessment of all the available evidence describing interventions to improve oral health for dependent adults	Community-dwelling or long-term care facility	Belgium, Canada, China, Denmark, Germany, India, the Netherlands, Sweden, Switzerland, UK, USA	3555 frail, partially or completely dependent adults aged over 65 years	Any OHE and training of the caregivers, nursing staff or the residents themselves - supervised instruction, face-to-face, action planning, teaching/dental hygiene aids,	Usual care or no intervention	Mostly positive but limited improvement in oral health status	3 weeks – 5 years	14 cRCTs, 3 RCTs	1998 - 2021	Dentists; dental hygienists; dental professionals; oral health teams; oral health specialist nurses; mouth-care providers; nurse educators; researchers; caregivers.

Author (year)	Research question	Setting	Primary study countries	Sample size	Interventions	Comparators	Outcomes of interventions	Timeline of follow-up	Primary study designs	Primary study years	Intervention providers
					demos, videos, presentations, multi-media, hands-on practice, self-learning, reinforcement						

Appendix G GRADE assessment

Each review starts with a ranking of high certainty and can receive one downgrade for a serious methodological concern on any one of the GRADE criteria (inclusion of non-RCTs in the systematic review; high RoB in randomisation or blinding for >75% of included studies; high heterogeneity ($I^2 >75%$); a sample size of between 100 and 199 participants; and 'no' on one of the AMSTAR 2 items selected as a critical domain) or two downgrades for a very serious methodological concern on either of two GRADE criteria (a sample size of <100 participants and 'no' on two or more of the AMSTAR 2 items selected as critical domains). Reviews including a single primary study are automatically downgraded to very low certainty.

Area assessed	Study design	RoB (randomisation)	RoB (outcome ascertainment)	Heterogeneity	Imprecision (based on sample size)	AMSTAR 2 review quality
Notes		If RoB for randomisation in individual trials was not reported in the review, we assumed that less than 75% of participants had low RoB.	If RoB for outcome ascertainment in individual trials was not reported in the review, we assumed that less than 75% of participants had low RoB.	If narrative synthesis only, we assumed high heterogeneity in our overview where I^2 value was not reported, it was assumed to be greater than 75%; if sensitivity analysis was conducted, we used the I^2 value from the sensitivity analysis over the main analysis.	If the review authors conducted more than one meta-analysis, we used the meta-analysis with the highest sample size for GRADE ; if reviews included multiple comparisons under a single outcome and no pooled analysis, we summed the total sample size for that outcome for GRADE; reviews that did not report a sample size were downgraded by two.	A 'partial yes' in an AMSTAR 2 critical or non-critical domain was counted as a 'no', except for a 'partial yes' given to a Cochrane review in critical domain 1 (protocol established prior to undertaking the review). Cochrane review authors are required to prepare a review protocol. Therefore, if adequate information pertaining to the protocol was not provided in a Cochrane review, the review received a 'partial yes' on AMSTAR 2 but was not downgraded.

GRADE Classification

GRADE level of evidence	Number of downgrades (derived from objective assessment)
High	Score awarded when 0 downgrades are applied
Moderate	Score awarded when 1 or 2 downgrades are applied
Low	Score awarded when 3 or 4 downgrades are applied
Very low	Score awarded when 5 or lower downgrades are applied

GRADE assessment of included reviews

Author (year)	Intervention categorisation	Outcome measure	No. studies	Study design	Trial quality (ROB randomisation)	Trial quality (ROB blinding outcome assessors)	Inconsistency (heterogeneity)	Imprecision (adequate sample size)	AMSTAR quality rating (critical domains)	Single study review	GRADE score	GRADE rating
Maternal and early childhood												
Early childhood caries												
Abuhaloob et al. (2019)	Simple OHE vs information only/no intervention	increments of decayed enamel/teeth	1				n/a			yes		Very low – auto downgrade
Colvara et al. (2021)	OHE + theory-based Interventions vs any or no intervention	caries level - dmft/dmfs	8	0	-1	0	0	0	-2	0	-3	Low

Faghihian et al. (2020)	OHE + theory-based Interventions (MI) vs traditional dental health education	rates of carious, missing, restored tooth surfaces	3	0	-1	0	0	0	-2	0	-3	Low
		presence of early childhood caries	8	0	-1	-1	-1	0	-2	0	-5	Very low
Gomersall et al. (2024) (Cochrane)	Simple OHE (combined oral hygiene, diet and feeding practice advice) vs standard care	caries presence in primary teeth	5	0	-1	0	-1	0	0	0	-2	Moderate
		dmfs	2	0	-1	0	0	0	0	0	-1	Moderate
		dmft	1				n/a			yes		Very low – auto downgrade
	Simple OHE (diet and feeding practice advice) vs standard care	caries presence in primary teeth	3	0	0	-1	0	0	0	0	-1	Moderate
	dmfs	2	0	0	-1	0	0	0	0	-1	Moderate	
	dmft	1				n/a			yes		Very low – auto downgrade	

	Simple OHE (breastfeeding promotion) vs standard care	caries presence in primary teeth	2	0	-1	0	0	0	0	0	0	-1	Moderate
		dmft	2	0	-1	0	0	0	0	0	0	-1	Moderate
	Simple OHE (diet advice) vs standard care	caries presence in primary teeth	1				n/a				yes		Very low – auto downgrade
Karande et al. (2023)	OHE + theory-based Interventions (MI) vs traditional dental health education	ICDAS	2	0	0	0	0	0	0	-2	0	-2	Moderate
Saxena et al. (2024)	Simple OHE vs control	early childhood caries	8	0	-1	0	0	0	0	-2	0	-3	Low
von Helde et al. (2024)	Simple OHE vs control	caries presence in primary teeth	2	-1	0	-1	-1	0	-1	0	0	-4	Low
Mothers' oral health behaviour													
Abuhaloob et al. (2019)	Simple OHE vs information only/no intervention	mothers' oral health behaviour with cleaning children's teeth	1				n/a				yes		Very low – auto downgrade
Mothers' oral health													

von Helde et al. (2024)	OHE (didactic + digital + verbal) vs control	periodontal parameters in mothers	2	-1	0	-1	-1	0	-1	0	-4	Low
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Children and adolescents

Atif et al. (2024)	OHE + training (leaflet/flashcard/books) vs other interventions/controls	oral hygiene - plaque/gingival/debris index scores	4	0	-1	0	-1	0	0	0	-2	Moderate
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	OHE + training (audiovisual aids) vs conventional teaching/controls	oral hygiene - plaque index scores	1				n/a			yes		Very low – auto downgrade
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	OHE + training (smartphone-based/e-learning) vs other interventions/controls	oral hygiene - plaque/gingival index scores	2	0	0	-1	-1	0	0	0	-2	Moderate
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	OHE + Training (lectures from dentist) vs other interventions/controls	oral hygiene - plaque/gingival index scores	3	-1	-1	-1	-1	0	0	0	-4	Low
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Dadipoor et al. (2023) OHE + training vs usual care Due to inaccuracies in the meta-analyses the data could not be used and therefore GRADE-ing the certainty of the evidence was considered inappropriate

Gurav et al. (2022)	Simple OHE (newer methods) vs traditional OHE/control on oral hygiene and dental health	dental plaque index	4	0	0	-1	-1	0	-2	0	-4	Low
		oral hygiene index	2	0	0	0	0	-1	-2	0	-3	Low
		debris index	2	0	0	-1	0	-1	-2	0	-4	Low
		gingival index	2	0	0	-1	-1	0	-2	0	-4	Low
		DMFT	2	-1	-1	0	-1	0	-2	0	-5	Very low
He et al. (2024)	OHE + theory-based Interventions vs conventional dental health education	oral hygiene (short-term) plaque index	11	0	-1	-1	-1	0	-1	0	-4	Low
		oral hygiene (long-term) plaque index	7	0	-1	-1	-1	0	-1	0	-4	Low
		oral hygiene short-term periodontal status (CPI)	3	0	-1	-1	-1	0	-1	0	-4	Low

		dental caries at 12 months (increment, DMFT)	2	0	0	-1	-1	0	-1	0	-3	Low
Kim and Kim (2024)	OHE + training vs usual care	dental health (plaque index)	4	-1	0	0	-1	0	-2	0	-4	Low
		dental health (gingival index)	4	-1	0	0	-1	0	-2	0	-4	Low
		gingival health	3	0	0	-1	0	0	-2	0	-3	Low
Nazari et al. (2025)	OHE + theory-based Interventions vs control	Due to inaccuracies in the meta-analyses with multiple time points reported as participants creating a unit-of-analysis error, the data could not be used and therefore GRADE-ing the certainty of the evidence was considered inappropriate.										
Priya et al. (2019)	OHE + skills acquisition vs no intervention or control	oral hygiene behaviours (toothbrushing and flossing)	6	-1	0	-1	-1	0	-2	0	-5	Very low
		unspecified oral health behaviours	2	-1	0	0	-1	0	-2	0	-4	Low
		dietary habits	3	-1	0	0	-1	0	-2	0	-4	Low
Shakir et al. (2021)	OHE + skills acquisition vs no intervention or control	changes in presence of caries (various measures)	3	0	-1	-1	-1	0	-2	0	-5	Very low

		frequency/amount of sugar intake (self-report)	5	0	-1	-1	-1	0	-2	0	-5	Very low
	OHE + skills acquisition with peer/parent involvement vs dentist/teacher delivered	Plaque and gingival scores	2	0	-1	0	-1	0	-2	0	-4	Low
Stein et al. (2018)	Dental professional provided OHE + combined vs usual care	plaque index (any OHE)	5	0	-1	0	0	0	-2	0	-3	Low
		gingival index (any OHE)	2	0	-1	0	0	0	-2	0	-3	Low
		oral health status (any OHE) DMFT, DMFS, dmfs	4	0	-1	-1	-1	0	-2	0	-5	Very low
		periodontal status (CPI)	1				n/a					Very low – auto downgrade
		mineralisation of molars	1				n/a					Very low – auto downgrade
		plaque index (OHE +)	2	0	-1	0	0	0	-2	0	-3	Low
		Plaque and gingival	3	0	-1	0	-1	0	-2	0	-4	Low

scores (OHE
+)

Tsai <i>et al.</i> (2020)	OHE + combined vs non-exposed control	Due to quality appraisal only and no risk of bias completed by review authors, we were unable to complete a GRADE assessment										
Xiang <i>et al.</i> (2020)	OHE + skills acquisition vs no intervention or control	gingival index (3 months)	3	0	-1	0	0	-1	-2	0	-4	Low
		plaque index (3 months)	5	0	-1	0	0	0	-2	0	-3	Low
		gingival index (6 months)	5	0	-1	-1	-1	0	-2	0	-5	Very low
		plaque index (6 months)	8	0	-1	0	-1	0	-2	0	-4	Low
		plaque index (12 months)	3	0	-1	0	0	-1	-2	0	-4	Low
		oral health behaviour	6	0	-1	-1	-1	0	-2	0	-5	Very low
Xiang <i>et al.</i> (2021)	OHE + theory-based Interventions vs conventional oral health education/control	Methodological issues with inclusion of trials not summarised and with sample sizes extracted from forest plot would indicate major concerns with this meta-analysis										

Older adults

Albrecht et al. (2016) (Cochrane)	OHE + combined vs usual care	dental plaque scores	6	0	-1	0	0	0	0	0	0	-1	Moderate
		denture plaque scores	5	0	-1	0	-1	0	0	0	0	-1	Moderate
		gingivitis scores	3	0	-1	0	-1	0	0	0	0	-2	Moderate
		denture stomatitis	2	0	-1	-1	-1	0	0	0	0	-3	Low
		root caries	2	0	-1	-1	-1	-1	0	0	0	-4	Low
Mehta et al. (2025)	OHE + combined vs usual care	dental plaque scores	4	0	-1	0	0	0	-1	0	0	-2	Moderate
		denture hygiene index scores	4	0	-1	0	-1	0	-1	0	0	-3	Low
Salazar et al. (2024)	OHE + combined vs usual care (in long-term care facilities)	dental plaque scores (short term)	9	0	-1	0	-1	0	-1	0	0	-3	Low
		dental plaque scores (longer term)	2	0	-1	-1	-1	-1	-1	-1	0	-5	Very low
		gingivitis-gingival index	6	0	-1	0	0	0	0	-1	0	-2	Moderate

	denture plaque scores (short term)	6	0	0	0	-1	0	-1	0	-2	Moderate
	denture plaque scores (longer term)	2	0	-1	-1	0	-1	-1	0	-4	Low
Supervised vs unsupervised OHE + combined (in long-term care facilities)	gingivitis-gingival bleeding index	2	0	0	0	-1	-1	-1	0	-3	Low
OHE + combined vs usual care in long-term care facilities	Oral health-related quality of life	1				n/a			yes		Very low – auto downgrade