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[Intervention Review]

Community-based population-level interventions for promoting child oral health

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ABSTRACT

Background

Dental caries and gingival and periodontal disease are commonly occurring, preventable chronic conditions. Even though much is known about how to treat oral disease, currently we do not know which community-based population-level interventions are most effective and equitable in preventing poor oral health.

Objectives

Primary

- To determine the effectiveness of community-based population-level oral health promotion interventions in preventing dental caries and gingival and periodontal disease among children from birth to 18 years of age.

Secondary

- To determine the most effective types of interventions (environmental, social, community and multi-component) and guiding theoretical frameworks.
- To identify interventions that reduce inequality in oral health outcomes.
- To examine the influence of context in the design, delivery and outcomes of interventions.

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Search methods

We searched the following databases from January 1996 to April 2014: MEDLINE, Embase, the Cochrane Central Register of Controlled Trials (CENTRAL), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Education Resource Information Center (ERIC), BIOSIS Previews, Web of Science, the Database of Abstracts of Reviews of Effects (DARE), ScienceDirect, Sociological Abstracts, Social Science Citation Index, PsycINFO, SCOPUS, ProQuest Dissertations & Theses and Conference Proceedings Citation Index - Science.

Selection criteria

Included studies were individual- and cluster-randomised controlled trials (RCTs), controlled before-and-after studies and quasi-experimental and interrupted time series. To be included, interventions had to target the primary outcomes: dental caries (measured as decayed, missing and filled deciduous teeth/surfaces, dmft/s; Decayed, Missing and Filled permanent teeth/surfaces, DMFT/S) and gingival or periodontal disease among children from birth to 18 years of age. Studies had to report on one or more of the primary outcomes at baseline and post intervention, or had to provide change scores for both intervention and control groups. Interventions were excluded if they were solely of a chemical nature (e.g. chlorhexidine, fluoride varnish), were delivered primarily in a dental clinical setting or comprised solely fluoridation.

Data collection and analysis

Two review authors independently performed screening, data extraction and assessment of risk of bias of included studies (a team of six review authors - four review authors and two research assistants - assessed all studies). We calculated mean differences with 95% confidence intervals for continuous data. When data permitted, we undertook meta-analysis of primary outcome measures using a fixed-effect model to summarise results across studies. We used the I^2 statistic as a measure of statistical heterogeneity.

Main results

This review includes findings from 38 studies (total $n = 119,789$ children, including one national study of 99,071 children, which contributed 80% of total participants) on community-based oral health promotion interventions delivered in a variety of settings and incorporating a range of health promotion strategies (e.g. policy, educational activities, professional oral health care, supervised toothbrushing programmes, motivational interviewing). We categorised interventions as dietary interventions ($n = 3$), oral health education (OHE) alone ($n = 17$), OHE in combination with supervised toothbrushing with fluoridated toothpaste ($n = 8$) and OHE in combination with a variety of other interventions (including professional preventive oral health care, $n = 10$). Interventions generally were implemented for less than one year ($n = 26$), and only 11 studies were RCTs. We graded the evidence as having moderate to very low quality.

We conducted meta-analyses examining impact on dental caries of each intervention type, although not all studies provided sufficient data to allow pooling of effects across similar interventions. Meta-analyses of the effects of OHE alone on caries may show little or no effect on DMFT (two studies, mean difference (MD) 0.12, 95% confidence interval (CI) -0.11 to 0.36, low-quality evidence), dmft (three studies, MD -0.3, 95% CI -1.11 to 0.52, low-quality evidence) and DMFS (one study, MD -0.01, 95% CI -0.24 to 0.22, very low-quality evidence). Analysis of studies testing OHE in combination with supervised toothbrushing with fluoridated toothpaste may show a beneficial effect on dmfs (three studies, MD -1.59, 95% CI -2.67 to -0.52, low-quality evidence) and dmft (two studies, MD -0.97, 95% CI -1.06 to -0.89, low-quality evidence) but may show little effect on DMFS (two studies, MD -0.02, 95% CI -0.13 to 0.10, low-quality evidence) and DMFT (three studies, MD -0.02, 95% CI -0.11 to 0.07, moderate-quality evidence). Meta-analyses of two studies of OHE in an educational setting combined with professional preventive oral care in a dental clinic setting probably show a very small effect on DMFT (-0.09 weighted mean difference (WMD), 95% CI -0.1 to -0.08, moderate-quality evidence). Data were inadequate for meta-analyses on gingival health, although positive impact was reported.

Authors' conclusions

This review provides evidence of low certainty suggesting that community-based oral health promotion interventions that combine oral health education with supervised toothbrushing or professional preventive oral care can reduce dental caries in children. Other interventions, such as those that aim to promote access to fluoride, improve children's diets or provide oral health education alone, show only limited impact. We found no clear indication of when is the most effective time to intervene during childhood. Cost-effectiveness, long-term sustainability and equity of impacts and adverse outcomes were not widely reported by study authors, limiting our ability to make inferences on these aspects. More rigorous measurement and reporting of study results would improve the quality of the evidence.

PLAIN LANGUAGE SUMMARY

Community-based population-level interventions for promoting child oral health

Tooth decay (caries) and gum disease are commonly occurring, preventable chronic conditions that can develop early in childhood and have lifelong impact on health and quality of life. These diseases are often seen in disadvantaged communities, and preventing the development of disease from an early age is considered an important step in reducing health inequalities across the population. Although much is known about how to treat oral disease clinically, we do not know which community-based population-level interventions are most effective and equitable in preventing poor oral health.

This review examined the evidence base from January 1996 until April 2014 on effective community-based oral health promotion interventions for preventing caries and gum disease among children from birth to 18 years of age.

We found little evidence that oral health education alone can make a difference in the level of caries, although some studies have reported improvements in gum health, oral hygiene behaviours and oral cleanliness. Oral health promotion interventions that included supervised toothbrushing with fluoridated toothpaste were generally found to be effective in reducing caries in children's baby teeth. Interventions of oral health education provided in an educational setting combined with professional preventive oral care in a dental clinic were effective in reducing caries in children's permanent teeth. We found several studies that offered multi-component and multi-setting interventions. Although these interventions were varied in nature (oral health education coupled with interventions such as toothpaste provision, sugarless chewing gum, motivational interviewing, professional oral care, training of non-dental professionals, fluoride varnish application and fluoride supplements), researchers reported a positive impact in most of the studies in this group. Interventions that focus on diet and reduced sugar consumption also hold promise for reducing caries, but additional studies are needed.

Interventions included in this review were diverse and were delivered in a range of childhood settings, including education, community, healthcare and home environments. Most interventions were delivered in educational settings; however, studies did not report broadly on the extent and nature of engagement with students, educators, caregivers and oral health service providers. Improvements can be made in recognising the multiple influences of broader determinants linked to clinical oral health outcomes, for example, oral health knowledge, behaviours and practices and healthcare systems, including those involving a psychosocial environment. More rigorous measurement and reporting of study findings would improve the quality of available evidence.