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Cochrane Database of Systematic Reviews 2016, Issue 7. Art. No.: CD002284.
DOI: 10.1002/14651858.CD002284.pub2.

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[Intervention Review]

Fluoride mouthrinses for preventing dental caries in children and adolescents

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Editorial group: Cochrane Oral Health Group.
Publication status and date: Edited (no change to conclusions), published in Issue 11, 2016.
Review content assessed as up-to-date: 22 April 2016.

Citation: Marinho VCC, Chong LY, Worthington HV, Walsh T. Fluoride mouthrinses for preventing dental caries in children and adolescents. *Cochrane Database of Systematic Reviews* 2016, Issue 7. Art. No.: CD002284. DOI: 10.1002/14651858.CD002284.pub2.

ABSTRACT

Background

Fluoride mouthrinses have been used extensively as a caries-preventive intervention in school-based programmes and by individuals at home. This is an update of the Cochrane review of fluoride mouthrinses for preventing dental caries in children and adolescents that was first published in 2003.

Objectives

The primary objective is to determine the effectiveness and safety of fluoride mouthrinses in preventing dental caries in the child and adolescent population.

The secondary objective is to examine whether the effect of fluoride rinses is influenced by:

• initial level of caries severity;

• background exposure to fluoride in water (or salt), toothpastes or reported fluoride sources other than the study option(s); or

• fluoride concentration (ppm F) or frequency of use (times per year).

Search methods

We searched the following electronic databases: Cochrane Oral Health's Trials Register (whole database, to 22 April 2016), the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library, 2016, Issue 3), MEDLINE Ovid (1946 to 22 April 2016), Embase Ovid (1980 to 22 April 2016), CINAHL EBSCO (the Cumulative Index to Nursing and Allied Health Literature, 1937 to 22 April 2016), LILACS BIREME (Latin American and Caribbean Health Science Information Database, 1982 to 22 April 2016), BBO BIREME (Bibliografia Brasileira de Odontologia; from 1986 to 22 April 2016), Proquest Dissertations and Theses (1861 to 22 April 2016) and Web of Science Conference Proceedings (1990 to 22 April 2016). We undertook a search for ongoing trials on the US National Institutes of Health Trials Register (http://clinicaltrials.gov) and the World Health Organization International Clinical Trials Registry Platform. We placed no restrictions on language or date of publication when searching electronic databases. We also searched reference lists of articles and contacted selected authors and manufacturers.

Selection criteria

Randomised or quasi-randomised controlled trials where blind outcome assessment was stated or indicated, comparing fluoride mouthrinse with placebo or no treatment in children up to 16 years of age. Study duration had to be at least one year. The main outcome was caries increment measured by the change in decayed, missing and filled tooth surfaces in permanent teeth (D(M)FS).

Data collection and analysis

At least two review authors independently performed study selection, data extraction and risk of bias assessment. We contacted study authors for additional information when required. The primary measure of effect was the prevented fraction (PF), that is, the difference in mean caries increments between treatment and control groups expressed as a percentage of the mean increment in the control group. We conducted random-effects meta-analyses where data could be pooled. We examined potential sources of heterogeneity in random-effects metaregression analyses. We collected adverse effects information from the included trials.

Main results

In this review, we included 37 trials involving 15,813 children and adolescents. All trials tested supervised use of fluoride mouthrinse in schools, with two studies also including home use. Almost all children received a fluoride rinse formulated with sodium fluoride (NaF), mostly on either a daily or weekly/fortnightly basis and at two main strengths, 230 or 900 ppm F, respectively. Most studies (28) were at high risk of bias, and nine were at unclear risk of bias.

From the 35 trials (15,305 participants) that contributed data on permanent tooth surface for meta-analysis, the D(M)FS pooled PF was 27% (95% confidence interval (CI), 23% to 30%; I^2 = 42%) (moderate quality evidence). We found no significant association between estimates of D(M)FS prevented fractions and baseline caries severity, background exposure to fluorides, rinsing frequency or fluoride concentration in metaregression analyses. A funnel plot of the 35 studies in the D(M)FS PF meta-analysis indicated no relationship between prevented fraction and study precision (no evidence of reporting bias). The pooled estimate of D(M)FT PF was 23% (95% CI, 18% to 29%; I^2 = 54%), from the 13 trials that contributed data for the permanent teeth meta-analysis (moderate quality evidence).

We found limited information concerning possible adverse effects or acceptability of the treatment regimen in the included trials. Three trials incompletely reported data on tooth staining, and one trial incompletely reported information on mucosal irritation/allergic reaction. None of the trials reported on acute adverse symptoms during treatment.

Authors' conclusions

This review found that supervised regular use of fluoride mouthrinse by children and adolescents is associated with a large reduction in caries increment in permanent teeth. We are moderately certain of the size of the effect. Most of the evidence evaluated use of fluoride mouthrinse supervised in a school setting, but the findings may be applicable to children in other settings with supervised or unsupervised rinsing, although the size of the caries-preventive effect is less clear. Any future research on fluoride mouthrinses should focus on head-to-head comparisons between different fluoride rinse features or fluoride rinses against other preventive strategies, and should evaluate adverse effects and acceptability.

PLAIN LANGUAGE SUMMARY

Fluoride mouthrinses for preventing dental caries in children and adolescents

Review question

How effective and safe is the use of fluoride mouthrinse for preventing tooth decay (dental caries) in children and adolescents compared with placebo (a mouthrinse without the active ingredient fluoride) or no treatment?

Background

Tooth decay is a health problem worldwide, affecting the vast majority of adults and children. Levels of tooth decay vary between and within countries, but children in lower socioeconomic groups (measured by income, education and employment) tend to have more tooth decay. Untreated tooth decay can cause progressive destruction of the tops of teeth (crowns), often accompanied by severe pain. Repair and replacement of decayed teeth is costly in terms of time and money and is a major drain on the resources of healthcare systems.

Preventing tooth decay in children and adolescents is regarded as a priority for dental services and is considered more cost-effective than treatment. Use of fluoride, a mineral that prevents tooth decay, is widespread. As well as occurring naturally, fluoride is added to the water supply in some areas, and is used in most toothpastes and in other products that are available to varying degrees worldwide. As an extra preventive measure, fluoride can be applied directly to teeth as mouthrinses, lozenges, varnishes and gels.

Fluoride mouthrinse has frequently been used under supervision in school-based programmes to prevent tooth decay. Supervised (depending on the age of the child) or unsupervised fluoride mouthrinse needs to be used regularly to have an effect. Recommended procedure involves rinsing the mouth one to two minutes per day with a less concentrated solution containing fluoride, or once a week or once every two weeks with a more concentrated solution. Because of the risk of swallowing too much fluoride, fluoride mouthrinses are not recommended for children younger than six years of age.

This review updates the Cochrane review of fluoride mouthrinses for preventing tooth decay in children and adolescents that was first published in 2003. We assessed existing research for Cochrane Oral Health, and evidence is current up to 22 April 2016.

Study characteristics

We included 37 studies in which more than 15,000 children (aged six to 14 years) were treated with fluoride mouthrinse or placebo (a mouthrinse with no active ingredient) or received no treatment. All studies assessed supervised use of fluoride mouthrinse in school settings, with two studies also including home use. Most children received a sodium fluoride (NaF) solution, given at 230 parts per million of fluoride (ppm F) daily or a higher concentration of 900 ppm F weekly or fortnightly. Studies lasted from two to three years. Reports were published between 1965 and 2005, and studies took place in several countries.

Key results

This review update confirmed that supervised regular use of fluoride mouthrinse can reduce tooth decay in children and adolescents. Combined results of 35 trials showed that, on average, there is a 27% reduction in decayed, missing and filled tooth surfaces in permanent teeth with fluoride mouthrinse compared with placebo or no mouthrinse. This benefit is likely to be present even if children use fluoride toothpaste or live in water-fluoridated areas. Combined results of 13 trials found an average 23% reduction in decayed, missing and filled teeth (rather than tooth surfaces) in permanent teeth with fluoride mouthrinse compared with placebo or no mouthrinse. No trials have looked at the effect of fluoride rinse on baby teeth. We found little information about unwanted side effects or about how well children were able to cope with the use of mouthrinses.

Conclusion

Regular use of fluoride mouthrinse under supervision results in a large reduction in tooth decay in children's permanent teeth. We found little information about potential adverse effects and acceptability.

Quality of the evidence

Available evidence for permanent teeth is of moderate quality. This means we are moderately confident in the size of the effect. Very little evidence is available to assess adverse effects.