

Supervised toothbrushing with fluoride toothpaste: a preventive strategy to decrease dental caries among schoolchildren.

Cepillado supervisado usando pasta dental fluorada: una estrategia preventiva para disminuir la caries dental en escolares.

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Dental caries is a multifactorial chronic disease that affects millions of people worldwide. Its prevalence stands over 60% in some populations, especially in developing countries.¹ This oral disease is associated with many factors such as biofilm, socioeconomic status, family background, educational level, tooth morphology, and oral hygiene habits.² It has been reported that this condition is common among children, affecting more than 50% of schoolchildren.¹ Thus, the design and implementation of preventive strategies focusing on the reduction of dental caries in the school setting are required.

Amongst the preventive options to dental caries control in children are the use of fluoride mouth rinses, varnishes, toothpaste, fissure sealants, and water fluoridation.^{3,4} However, the quality of evidence on the effectiveness of some of those interventions is uncertain. It suggests that the implementation of preventive programs should consider other factors such as the targeted population's characteristics, application mode, and available sources. In this sense, some reports suggest that supervised toothbrushing with fluoride toothpaste is one of the most effective methods to prevent dental caries.^{3,5,6} Thus, this perspective paper focuses on the use of supervised toothbrushing with fluoride toothpaste among schoolchildren.

Supervised toothbrushing with fluoride toothpaste strategy

The mechanical control of biofilm plays a key role in dental caries prevention. In fact, toothbrushing could be considered as a mandatory habit for oral health maintenance.⁷ However, some aspects should be considered to guarantee its effectiveness such as toothbrushing's methods, toothbrushes, types of toothpaste, and the users' intrinsic characteristics. This preventive strategy consists of close monitoring of oral hygiene practices by an adult to confirm that toothbrushing has been performed properly.⁸ Thus, schools are good settings to implement this strategy, where teachers could supervise their students' toothbrushing. However, it is useful to mention that the educational system commitment is essential to ensure the success of this intervention. One of the advantages of this approach is that it allows the regulation of the amount of toothpaste

used during brushing and the propensity in some young children to consume significant quantities of toothpaste.

Scientific evidence about supervised toothbrushing with fluoride toothpaste

There is evidence from two Cochrane systematic reviews (CSRs) suggesting that supervised toothbrushing adds a benefit to use the fluoridated toothpaste among children and adolescents.^{3,9} The first CSR included a meta-regression analysis considering important covariates and concluded that supervised toothbrushing had a statistically significant increase of about 10% (95% CI=4% to 17%, p -value<0.05) of the prevent fraction compared to unsupervised toothbrushing.³

Similarly, the second CSR stated that the effect of supervised use of toothpaste was 11% (95% CI=3.7% to 17.0%, p -value<0.001) higher compared to unsupervised home use.⁹

Moreover, some primary studies have suggested the use of supervised toothbrushing among schoolchildren to prevent dental caries. To illustrate, Clark *et al.*,⁶ conducted a study including children aged 10 to 13 years from Northland, New Zealand, and concluded there was a significant reduction in the prevalence of caries in the group receiving the supervised school toothbrushing intervention versus the group without intervention. Likewise, a randomized controlled trial recruiting school primary children in North West London compared the differences in caries increment between a group receiving teacher-supervised toothbrushing with toothpaste with fluoride at 1,450 parts per million (ppm) once a day at school and the non-intervention group, concluding that there was a statistically significant difference in the overall caries increment, in favor of intervention group (2.60 versus 2.92; 10.9%; p -value<0.001).¹⁰

Similarly, a follow-up study of a randomized controlled trial conducted in Scotland concluded that 54 months after the trial was finished, the caries increment was significantly lower (1.62 versus 2.65; p -value =0.002) in the group receiving supervised toothbrushing at school plus the provision of brushes and toothpaste for use at home compared to the non-intervention group.

It is important to highlight that fluor (F) is considered the most important chemical agent to dental caries prevention, thus a vast amount of commercially available

oral hygiene products such as toothpaste contain it in their composition. Since fluoride toothpaste could have a great impact on the effectiveness of toothbrushing, the proper selection of the ideal toothpaste is essential in the control of dental caries. The scientific evidence from many systematic reviews^{3,9,11,12} has shown that fluoride toothpaste is effective in decreasing the development of new dental caries lesions, and its effectiveness can vary depending on the concentration of fluoride and caries levels at baseline.

A CSR including 74 primary studies and 42,300 participants concluded that there is a considerable decrease in dental caries lesions comparing the use of fluoride toothpaste against non-fluoride toothpaste or no use of toothpaste, the DMFS (decayed-missing-filled index) pooled prevent fraction was 24% (95% CI=21%-28%, p -value<0.0001).³ In other words, to prevent one DMFS in any population, it depends on its caries increment per year, in populations with a caries increment of 2.6 DMFS annually, 1.6 children need to brush their teeth using fluoride toothpaste, whereas in populations with an increment of 1.1 DMFS, the need is 3.7 children.

One of the aspects that should be considered in the fluoride toothpaste selection is the fluor concentration. Nowadays, several commercial fluoride toothpaste brands are available including a wide range of concentrations (250ppm to 5,000ppm), with some available over the counter (from 700ppm to 1,500ppm), and other kinds of fluoride toothpaste only available on prescription (from 2,800ppm to 5,000ppm).⁸ In this regard, a meta-analysis has demonstrated that the use of fluoride toothpaste containing concentrations from 1,000ppm to 1,500ppm have a greater impact on decrease primary teeth caries, with a prevent fraction of 31% (95% CI= 18% to 43%, p -value<0.0001) compared to non-intervention group.¹³

Likewise, a recent CSR including 96 randomized controlled trials, concluded that there is a high certainty scientific evidence supporting that fluoride toothpaste (from 1,000 ppm to 1,250ppm) is more effective (standardized mean difference (SMD) -0.28; 95% CI=-0.32 to -0.25) than non-fluoride toothpaste in caries prevention among children and adolescents with permanent dentition.¹⁴ Similarly, there is a moderate certainly evidence that toothpastes containing 1,450ppm to 1,500ppm are more effective than non-

fluoride toothpastes (SMD -0.36; 95% CI= -0.43 to -0.29, p -value<0.001).

However, when toothbrushing using toothpaste containing 1,000ppm to 1,250ppm fluoride is compared to toothbrushing with 1,450ppm to 1,500ppm fluoride toothpaste, the latter concentration slightly reduced (SMD -0.08, 95% CI=-0.14 to -0.01, p -value<0.001) the dental caries increment compared with 1,000 ppm to 1,250ppm fluoride toothpaste.

They also found that the use of fluoride toothpaste containing the highest (1,700ppm to 2,200ppm or 2,400 to 2,800ppm) concentrations has a similar effect compared to 1,450ppm to 1,500ppm fluoride toothpaste. Therefore, to avoid the adverse effects related to the use of toothpaste containing high concentrations of fluoride, their use should be limited to specific situations depending on the individual risk caries assessment.

Finally, another determinant factor in the effectiveness of toothbrushing is its frequency and duration. There is evidence from a CSR suggesting that increases in the toothbrushing frequency improves the effect of the use of fluoride toothpaste, with about 14% increment (95% CI= 6% to 22%, p -value<0.001) in the

prevent fraction, when toothbrushing is performed once per day compared to twice per day.³ Similarly, another systematic review¹⁵ including 33 primary studies, concluded that self-reported infrequent brushers had a higher incidence of dental caries than those brushing their teeth frequently, with an odds ratio of 1.50 (95% CI=1.34 to 1.69, p -value<0.001) and a significant increment of dental caries (SMD=0.28, 95% CI= 0.13 to 0.44, p -value<0.001); when different toothbrushing frequencies were compared, the odds ratio of having dental caries was 1.45 (95% CI=1.21 to 1.74, p -value<0.001) comparing two or more times per day *versus* less than twice per day; and 1.56 (95% CI = 1.37 to 1.78, p -value<0.001) comparing one or more times per day *versus* less than once per day.

CONCLUSIONS

Supervised toothbrushing with fluoride toothpaste is an effective method to decrease dental caries among schoolchildren, especially in developing countries. Thus, in order to improve the oral health status of children, this preventive strategy should be implemented in the school setting.

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