Short Communication

Recommending 1000 ppm fluoride toothpaste for caries prevention in children

Shijia Hu1,5, Wen Pui Bien Lai2, Wanyi Lim3 and Ruixiang Yee4,5

Abstract
The caries prevalence among Singapore children remains high, with almost 50% affected by the age of 6 years. Among oral hygiene homecare, toothpastes with a minimum fluoride concentration of 1000 ppm or greater have been shown to be more effective at preventing caries. Previous concerns with dental fluorosis have led to the marketing of non-fluoride and low-fluoride toothpastes specifically for children. In the local context, many parents start their children on these products due to ingestion concerns and recommendations of the product, rather than on sound advice from a healthcare professional. The latest recommendation is to use a smear size of 1000 ppm or greater fluoride toothpaste in children under 3 years of age with high caries risk. For children aged 3 years and older, a pea size of 1000 ppm or greater fluoride toothpaste should be used. As medical physicians are typically the first healthcare encounter for many children, they are well positioned to provide recommendations on the concentration and amount of fluoride toothpaste to be used in young children.

Keywords
Preventive dentistry, preventive medicine, toothpastes, dental care for children

Introduction
Despite being a developed country with good access to healthcare, the caries prevalence among Singapore children remains high. Almost 50% of children are affected by the age of 6 years and 90% of these lesions have been found to be untreated.1 Untreated dental caries can result in infections, leaving children in pain and severely impacting their quality of life, requiring hospital admission and/or dental treatment under general anaesthesia.2 Data from the Health Promotion Board, School Dental Service revealed a rising trend of caries prevalence in 7-year-old children from 48.1% in 2010 to 53.1% in 2016 (Figure 1). As such, there is an urgent need to focus on the prevention of dental caries, especially in young children.

Preventive approaches which have been successful in reducing caries prevalence in young children include water fluoridation3 and infant oral health programmes.4 The daily use of optimally fluoridated toothpaste (i.e. ≥1000 ppm fluoride) is a cost effective measure with extensive reach. However, such individualised preventive approaches can only succeed with good education targeted at parents and compliance.5

Effectiveness of toothpaste in preventing dental caries
Traditionally, it was believed that brushing teeth twice a day will prevent tooth decay; however, evidence suggests that tooth brushing alone may not be effective.6 It is therefore more accurate to stress that using an optimally fluoridated toothpaste is more effective at preventing decay than tooth brushing alone.7 In a 2019 Cochrane Review, Walsh et al. reviewed the effectiveness of fluoride toothpaste of different concentrations in preventing dental caries in children, and found a

1Faculty of Dentistry, National University of Singapore, Singapore
2Paediatric Dentistry Unit, National Dental Centre Singapore, Singapore
3School Dental Service, Youth Preventive Services, Health Promotion Board, Singapore
4Dental Service, KK Women’s and Children’s Hospital, Singapore
5Society for Paediatric Dentistry, Singapore

Corresponding author:
Shijia Hu, Discipline of Orthodontics and Paediatric Dentistry, Faculty of Dentistry, National University of Singapore, 9 Lower Kent Ridge Road, Singapore 119077, Singapore. Email: Shijia_hu@nuhs.edu.sg

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dose-dependent reduction of caries with respect to the fluoride concentration in toothpaste. There was moderate to high evidence that 1000 ppm or greater fluoride toothpaste was more effective at preventing caries when compared to non-fluoride toothpaste. Although there was also some evidence for caries prevention even with low (<1000 ppm) fluoride toothpaste, it was not significantly different when compared to a placebo.

As such, the use of 1000 ppm or greater fluoride toothpaste for caries prevention in children has been recommended in America, Europe, the United Kingdom and New Zealand. Accordingly, low fluoride toothpaste is no longer available on the market in America. In contrast, Australia is not against the use of low fluoride toothpaste or no toothpaste in children under 1.5 years of age. It has higher water fluoridation levels (0.6–1.1 ppm) than Singapore. The water fluoridation level in Singapore was reduced to 0.5 ppm, which makes the use of an optimally fluoridated toothpaste even more important.

Acute and chronic toxicity of fluoride ingestion

A major concern of using fluoride toothpaste in young children is the swallowing of excessive fluoride due to an inability to spit. Acute fluoride toxicity from toothpaste ingestion is rare but potentially dangerous. This may occur when a child swallows a significant amount of fluoride toothpaste; that is 50 g of 1000 ppm fluoride toothpaste (around half a tube of adult-sized toothpaste). Therefore, toothpaste should be considered a medicament, kept out of reach of young children and only dispensed by adults.

Swallowing lower amounts of fluoride toothpaste may result in concerns localised to teeth. Chronic systemic fluoride exposure can affect the maturation of developing enamel and lead to dental fluorosis in young children. Mild dental fluorosis presents as diffuse white opacities on the affected teeth, which is a minor aesthetic issue with no functional defect or impact on a child’s quality of life. In 2017, only 15.4% (41,651 out of 270,630) of Singaporean students screened by the Health Promotion Board were found with dental fluorosis (unpublished data). Although most of the cases detected were mild, in cases of moderate to severe fluorosis, yellow-brown discoloration and enamel defects can develop, negatively affecting the child’s appearance and function. Excessive fluoride exposure in children under 3 years results in the largest aesthetic impact to the anterior permanent teeth. Recent systematic reviews have found an increased risk of fluorosis in children who brush with a fluoride toothpaste when they are aged 2 years and under. The critical period of anterior permanent tooth development occurs in children under 3 years of age, meaning that excessive fluoride exposure during that period results in the largest aesthetic impact.

Historically, no or low fluoride toothpaste was marketed for children because of the propensity for swallowing and the risk of fluorosis. Anecdotally, these toothpastes have the major share of the local market due to effective advertising and brand name recognition. Many parents recognise the brands of toothpaste marketed for children and assume that they will be effective at preventing decay. Furthermore, toothpaste labels are confusing, often with varying fluoride concentrations and age recommendations that are not necessarily evidence based. There has recently been a proliferation of non-fluoride toothpaste marketed as safe for children to swallow, due to unsubstantiated fears with regard to fluoride. Any fluoridated toothpaste with 1000 ppm or greater...
Fluoride can be recommended for use in children. In Singapore, all fluoridated adult toothpastes have 1000 ppm or greater fluoride. In particular, when toothpastes contain more than 0.76% sodium monofluorophosphate or more than 0.22% sodium fluoride, they have 1000 ppm or greater fluoride (Figure 2(a)). There are children’s toothpastes with 1000 ppm or greater fluoride available commercially and this will be stated explicitly on the labels (Figure 2(b)).

Healthcare providers need to balance between advocating the caries-preventive benefit of topical fluoride use and the risk of dental fluorosis in children. There is high quality evidence of the topical action of fluoride in preventing and reducing dental caries. Yet most children can predictably spit out toothpaste only at the age of 5–6 years. Using a pea-sized amount (0.25 mg fluoride) of toothpaste more than doubles the amount of fluoride potentially ingested when compared to a smear-sized amount (0.1 mg fluoride). To maximise the benefit of fluoride toothpaste while mitigating the risk of dental fluorosis, a smaller amount of fluoride toothpaste has been recommended for children under 3 years.

Fluoride toothpaste recommendation

As medical physicians are typically the first healthcare encounter for many children, they are well positioned to provide recommendations on the concentration and amount of fluoride toothpaste to be used in young children. When there is concern of dental fluorosis, the toothpaste recommendation for children under 3 years should be limited to those at high risk of dental caries. Alternatively, a referral to a child-friendly dentist before a child turns age one year to determine the caries risk and appropriate recommendation for toothpaste use can be made.

Caries risk factors in Singaporean children (adapted from Gao et al., 2010):

- Lower socioeconomic status
- Increased frequency of between-meal sweet snacks
- Increased levels of dental plaque
- Presence of bedtime feeding
- Decreased fluoride exposure.

In line with several international guidelines and recommendations on the usage of fluoride toothpaste, we recommend the use of toothpaste containing 1000 ppm or greater fluoride in children for caries prevention. Parental supervision during brushing is critical to regulate the amount of toothpaste dispensed and reduce accidental swallowing of toothpaste.

Children under 3 years old

- At high risk of caries: smear size (grain of rice size) of 1000 ppm fluoride toothpaste (Figure 3(a))
Children 3 years old and above

- Pea size of 1000 ppm or greater fluoride toothpaste (Figure 3(b)).

In conclusion, we recommend the use of toothpaste containing at least 1000 ppm of fluoride in children for the prevention of dental caries. However, it is important to control the amount of toothpaste used to reduce the risk of fluorosis.

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NA

Conflict of interest

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ORCID iD

Shijia Hu https://orcid.org/0000-0001-6136-9926

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