

Use of Fluoridated Dentifrices among Children: Are We in the Right Direction?

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Abstract

Introduction Use of topical fluorides in dentifrices has always been an important tool in prevention of dental caries in young children. Due to the easy availability of various low and high fluoride dentifrices, the parents have no clear understanding about their correct age-appropriate use in children. This study was undertaken to evaluate and understand the trend and current practices among the end user.

Materials and Methods A total of 173 children aged 4 to 6 years were enrolled in the study from schools located in two different geographical areas of the Chandigarh city; group 1 ($n = 90$) from a *peri-urban slum cluster*: (Govt. Primary School, Indira Colony, Mani Majra, $n = 51$); Govt. Middle School, Mani Majra ($n = 39$); group 2 ($n = 83$) from an *urban private city school* (Ankur, Punjab University, Sector 14) using cluster sampling method. Two examiners using type IV examination examined all the children aged 4 to 6 years present using a preinstructed close-ended questionnaire. Data were analyzed using SPSS Software Version 25 (SPSS Inc., Chicago, IL, United States).

Results The data regarding the knowledge of fluoride in pastes showed that 85% of the children were using high fluoride pastes, 10% were using nonfluoride pastes, and 5% were using low fluoride pastes. In group 1, none of the users were aware about the benefits/risk of using fluoride toothpastes and only 22% were aware in group 2. Only 27% of children in group 1 dispensed the correct amount of dentifrice for this age group i.e., a pea head size versus 67% in group 2; a half brush length was dispensed by 61.5% in group 1 and 28% in group 2, and just a smudge by 11.5% in group 1 and 5% in group 2. Forty one percent children in both the groups had a history of having intentionally consumed the toothpaste. The toothpaste was dispensed to the child by parent in 89% of cases in group 2 and only 50% in group 1 and 88% parents claimed to always supervise the child while tooth brushing versus only 53% in group 1. Majority of the respondents, i.e., 97% in group 1 and 63% in group 2 had never been explained about the correct method of use of fluoride paste in children.

Conclusion Knowledge about fluoridated toothpastes is low among the population. The children in peri-urban slums areas are exposed to the high fluoride pastes from

Keywords

- ▶ fluoride dentifrices use
- ▶ very young children
- ▶ trend

very early in life and there is no other toothpaste which is brought home except for those which are commonly used among the members. In the city schools; however, a small percentage of population uses low fluoride pastes in children, possibly due to a greater awareness and access to information, but has no clear idea about their limitations and benefits of age-appropriate use. Till appropriate guidelines are available for the country, a safe practice to follow is tailoring individual need based protocol. The children in peri-urban slums areas need to be educated more on the health practices and importance of use of fluoride dentifrices and the children in the city schools need to be guided more on the age appropriate use of high and low fluoride dentifrices.

Introduction

Prevention of oral diseases is an important aspect of Pediatric Dentistry. Topical fluorides from water, dietary sources, professional applications, etc. have a well-proven role in prevention and progression of dental caries in children.¹ Dentifrices are the most widely used source of topical fluorides for children and have caused the largest impact on oral health, since their inception in early 1960s. Fluoride in the dentifrices acts by decreasing the rate of enamel demineralization and by enhancing the remineralization of an early carious lesion.^{2,3} Presence of fluoride in the tooth also increases the resistance of the remineralized areas to secondary acid attack.^{2,3} The use of fluorides in dentistry, however, has always been considered a two-edged sword with the cariostatic effect of fluoride being well proved, but not without the risk of causing fluorosis in the developing dentition.⁴⁻⁶ When used in very young children with the rising incidence of early childhood caries (ECC), fluoride as a preventive modality of dental caries, however, has become indispensable because of its cost effectiveness.⁷

Fluoride as a mineral is required in our body in very low quantities of around 0.05 to 0.07 mg/kg body weight to exert its desirable effects.⁸ The risk of fluorosis occurs when the amount of fluoride ingested exceeds the amount required during tooth formation/development.⁴ An inadvertent consumption of fluoridated toothpastes in a young child with developing teeth has been associated with mild fluorosis as it remains an important source of ingested fluoride.^{9,10}

To prevent these sequelae, and also to deliver the benefit of fluoride to children, low fluoride pastes with concentration of fluoride almost half or one fourth of that present in most conventional pastes had been devised and marketed.¹¹⁻¹⁵ The different guidelines have taken the safety issues in consideration but concerns however, have been raised regarding the questionable efficacy of these low fluoride pastes.¹⁶⁻¹⁹

With the easy availability and marketing of various low and high fluoride toothpastes in the market²⁰ one does not know the current practices among the end user, which is helpful in formulating new guidelines or reinforcing the current ones. This study was undertaken to evaluate and understand the trend among 4 to 6 years old children regarding use of fluoride pastes in the city.

Materials and Methods

A total of 173 children aged 4 to 6 years were enrolled in the study from schools located in two different geographical areas of the Chandigarh city; group 1 ($n = 90$) from a *peri-urban slum cluster*: (Govt. Primary School, Indira Colony, Mani Majra, $n = 51$); Govt. Middle School, Mani Majra ($n = 39$); group 2 ($n = 83$) from an *urban private city school* (Ankur, Punjab University, Sector 14) using cluster sampling method. Ethical clearance from the Institute's ethics committee was obtained prior to initiation of the study. The school authorities were contacted prior to any interaction with the children for their consent, and an appropriate time suitable for recording of the questionnaires in the presence of at least one parent was decided. Two examiners using type IV examination examined all the children aged 4 to 6 years present. The examiners were calibrated (A K. and M.K.) before the start of the study. A preinstructed close-ended questionnaire regarding the use and practices of fluoride paste among children including the routine oral health practices was prepared and with at least one parent of each child within the school premises.

Data were analyzed using SPSS Software Version 25 (SPSS Inc., Chicago, IL, United States). Chi-square analysis was used to find the significance of the cross tabulation of counts of two or more variables. Student *t*-test and analysis of variance was used to find the significance of the cross tabulation of a variable with the mean of another variable.

Results

The data recorded were mainly categorized as (1) routine oral health practices and (2) practices pertaining to the use of dentifrices (► **Table 1**).

Routine Oral Health Practices

Majority of the children in group 1 either brushed their teeth only once daily (54%) or were irregular brushers (34.4%). Only 5.5% brushed twice daily and the remaining had not started brushing till now. Whereas in group 2, 79.4% brushed at least once daily and 13.3% brushed twice daily. The irregular brushers were 7.3%. Ninety-eight percent of children in group 2 were using the pediatric sized brush versus 72%

Table 1 Distribution of parameters recorded pertaining to use of fluoride dentifrices among the two groups

Questions	Group 1 responses	Group 2 responses	p-Value
Q1. Frequency of tooth brushing			$p < 0.001$
Once daily	49	66	
Twice daily	5	11	
Thrice daily	31	6	
Not started	5	0	
Q2. Average sugar exposures per day			$p < 0.001$
Less than three times	40	54	
3–5 times	23	27	
More than 5 times	22	2	
Q3. Has the child been introduced to dental floss?			$p = 0.075$
Never seen or heard	84.2%	84.14	
Aware	15.8%	15.84	
Q4. Type of toothbrush used			$p < 0.001$
Adult size	15	2	
Pediatric size	61	81	
Not specific	9	0	
Q5. Type of toothpaste used			$p < 0.001$
Fluoridated	56	71	
Non fluoridated	12	3	
Low fluoride	0	7	
Did not know	11	0	
Do not use	7	2	
Q.6 Are you aware about fluoridated toothpastes?			$p < 0.001$
No	85	65	
Yes	0	18	
Q7. Amount of toothpaste dispensed			$p < 0.001$
Half brush length or more	48	23	
Pea head size	21	54	
Just a smudge	9	4	
Q8. Method of dispensing toothpaste			$p < 0.001$
Every time by parent	39	72	
Parent/child	18	8	
Child	14	1	
By child under supervision	7	0	
Q9. Is the child able to spit out after brushing?			$p = 0.067$
Yes, fully	42	64	
Partially	33	16	
Never tries/unable	3	1	
Q10. Has the child ever intentionally consumed toothpaste?			$p = 0.421$
Do not know	7	2	
Yes	32	33	
No	46	48	

continued

Table 1 (continued)

Questions	Group 1 responses	Group 2 responses	p-Value
Q11. Have you ever been explained the correct use of toothpaste by a health care provider?			
Yes	1	9	p < 0.001
Other sources	2	22	
No	82	52	
Q12. Do you supervise your child while toothbrushing?			
Always	45	73	p < 0.001
Partially	19	9	
Never, does on its own	21	1	

in group 1. Majority of children in group 1 had more than five times sugar intake per day (26%) versus very few (2.4%) in group 2. Twenty seven percent in group 1 and 32.5% in group 2 had sugar exposures between 3 to–5 per day. Sugar exposures less than three times a day were present in 47% in group 1 and 65% in group 2.

Awareness of Dental Floss

Only 15% of children in both the groups were aware of dental floss and knew it should be customarily used along with tooth brushing every day. This may be due to the fact that dental floss is not as well marketed as other oral hygiene aids in India and that there is a lack of awareness regarding dental floss among the general population. So, it can be recommended that dental flossing should be taught at school level.

Types of Toothbrushes

It was seen that around 71% in group 1 and 97% of group 2 children uses pediatric size of tooth brush and 17% in group 1 and 2% in group 2 uses adult size tooth brush. It may be because of nonavailability or lack of knowledge among the parents; however, it should be kept in mind that such children become more prone to the trauma due to toothbrush injury.

Practices Pertaining to Use of Dentifrices

The data regarding the knowledge of fluoride in pastes showed that 85% of the children were using high fluoride pastes, 10% were using nonfluoride pastes, and 5% were using low fluoride pastes. In the group 1, none of the users were aware about the fluoride toothpastes and only 22% were aware in the group 2. Only 27% of children in group 1 dispensed the correct amount of dentifrice for this age group i.e., a pea head

size versus 67% in group 2; a half brush length was dispensed by 61.5% in group 1 and 28% in group 2, and just a smudge by 11.5% in group 1 and 5% in group 2. Forty-one percent children in either group had a history of having intentionally consumed the toothpaste. The toothpaste was dispensed to the child by parent in 89% of cases in group 2 and in only 50% in group 1 and 88% parents claimed to always supervise the child while tooth brushing versus only 53% in group 1. Majority of the respondents' i.e., 97% in group 1 and 63% in group 2 had never been explained about the correct method of use of fluoride paste in children.

Discussion

Fluoride remains the cornerstone of the noninvasive management of noncavitated caries lesions and the use of fluoride toothpaste is generally recognized as the main reason for the decline in caries in industrialized countries over the last four decades. It is the only nonprescription toothpaste additive proven to prevent dental caries.

One of major concern in having fluoridated toothpaste in the vicinity of a young child is inadvertent ingestion leading to toxicity. Taking the average amount of toothpaste in a tube to be 100 g, and the average amount of fluoride concentration to be 1,000 ppm in our country (as per drug and cosmetic act, 1940),²¹ the total amount of fluoride, which is available, is 100 mg (1,000 ppm = 1mg/g). The safely tolerated dose (STD) of fluoride is 8 to 16 mg/kg body weight.²² Taking the average body weight of a 5-year-old child to be 20 kg, the STD is between than 160 to 320 mg of fluoride, which remains in very safe limits. The probable toxic dose (PTD) is 5 mg/kg of body weight,²² that is 100 mg of fluoride. The child, therefore, may show symptoms of toxicity only if almost the entire paste is inadvertently ingested. Second, there have been concerns about the occurrence of fluorosis in the permanent dentition due to early use of fluoride pastes.²³ The American Academy of Pediatric Dentistry, therefore, recommends²⁴ use of only a smudge or rice grain size (► Fig. 1)²⁴ of fluoridated paste (0.125 g) dispensed each time in children up to 3 years of age to reduce the risk of fluorosis due to ingestion of fluoride from the paste. For children up to 6 years of age, a pea size of the toothpaste is to be dispensed (0.25 g). These children ingest approximately 30 to 40% of the paste dispensed.



Fig. 1 The rice grain and pea head size of toothpastes.²⁴

The European Academy of Pediatric Dentistry recommends²⁵ a use of pea size of 1,000 ppm fluoride toothpaste (0.25 g) for children between 2 to–6 years. Therefore, when using fluoridated toothpaste (1,000 ppm) for a young child, if appropriate instructions are followed, there is minimal risk to the child of developing mild fluorosis or toxicity.

Overall, in this study, it is seen that knowledge about fluoridated toothpastes is low among the population. Some parents have not heard about the low fluoride pastes and avoid tooth brushing with pastes due to risk of ingestion, whereas others who have heard about the low fluoride pastes continue to use it even beyond two years and have no clear idea about when to stop its use. The children in peri-urban slums areas are exposed to the high fluoride pastes from very early in life and there is no other which is brought home except for those for common use among the members. In the city schools; however, a small percentage of population uses low fluoride pastes in children, possibly due to a greater awareness and access to information, but was found to have no clear idea about their limitations and benefits of age appropriate use. Lima et al. in a cross sectional observation study on tooth brushing habits of Brazilian schoolchildren aged 3 to–4 years found 42% children from high socioeconomic status (SES) and 2.7% children from low SES to be using toothpaste without fluoride or below 1000 ppm fluoride. There was a lot of difference in the oral health practices between two groups in the present study.²⁶ The number of sugar exposure children is quite high and knowledge about brushing twice daily and introduction to flossing still remains low. It is imperative, therefore, to guide the population about the need for an age appropriate use of fluoride pastes and also instruct them about their safe practice. The children in peri-urban slums areas need to be educated more on the health practices and importance of use of fluoride dentifrices and the children in the city schools need to be guided more on the age appropriate use of high and low fluoride dentifrices. One limitation of the study is that the toothpastes marketed without any known concentration of fluoride were recorded as fluoride free and actual fluoride levels in these tooth pastes were not assessed as this was beyond the scope of the present investigation.

Conclusion

Till appropriate guidelines are available for the country, a safe practice to follow is tailoring individual need based protocol. In a city like Chandigarh, where the water fluoride levels are only 0.3 ppm and there is no other source of fluoride apart from the dietary fluoride, topical fluorides remain an important caries preventive tool. Since the risk of consumption is high till 2 years and the diet of the child is strictly under parental control reducing the number of sugar exposure, a low fluoride dentifrice can be used. Also, the most esthetically vulnerable teeth—the maxillary incisors, remain at a risk of being affected with enamel hypomineralization between 22 to 25 months. Beyond two years, the child undergoes individual choices about food, the risk of increased sugar

exposure and more frequent snacking increases; a high fluoride paste with brushing under strict parental supervision is thus advisable.

Conflict of Interest

None declared.

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