Original Article

Dental Health Behavior Pertaining to Fluoridated Toothpaste Usage among the Parents of Private and Government School Students in Mangalore, South India

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Abstract

Background: Promoting oral self-care capacity and the use of fluoride toothpaste is an appropriate strategy for the prevention of oral diseases among schoolchildren, especially in a developing country like India. **Aim:** To assess the oral health behavior of fluoridated toothpaste usage among parents of 12-year-old schoolchildren in Mangalore, South India. **Materials and Methods:** Around 523, 12-year-old school students selected by cluster random sampling were given questionnaires to be completed by the parents to elicit their dental health behavior. Data were analyzed using SPSS software version 16.0. Bivariate analysis of the association of dental health behavior and the type of the school was conducted using Chi-square test. Finally, we fitted a multivariate binary logistic regression model to estimate the strength of association, and $P < 0.05$ was considered statistically significant. **Results:** In this study, all the schoolchildren used toothpaste to clean their teeth, and the major factors which influenced the selection of toothpaste were promotional offer and advertisement for government and private schools, respectively. Multivariate analysis revealed that private schoolchildren had higher odds for using fluoridated toothpaste (odds ratio [OR] – 6.04 confidence interval [CI]: 1.929–18.912), receiving instructions from dentist (OR – 4.63 [CI: 2.770–7.741]), and brushing twice daily (OR – 0.37 [CI: 0.219–0.629]). Enrollment in government schools was associated with lower odds for selecting toothpaste based on professional advice (OR – 0.11 [CI: 0.072–0.177]). **Conclusions:** Private schoolchildren had higher usage of fluoridated toothpaste. Private schoolchildren had higher usage of fluoridated toothpaste and receiving instructions from dentist about dental health behavior. To overcome the Inverse Care Law, it is of utmost importance to create awareness among government schoolchildren.

Keywords: Behavior, fluoride, parents, schools, toothpaste

Introduction

The present eon of dental caries management has transcended slowly from "extension for prevention" to "prevention of extension" paradigm. Dental caries is a health concern worldwide, and the success of finding a cure is still debatable.[1] Dental caries is a sequential process of microbiological and chemical events which first leads to a reversible change and eventually to an irreversible loss of tooth tissue.[2]

In developing countries where resources are scarce, an alternative to therapeutic approach for the management of carious teeth lies in promoting oral health by targeting modifiable risk factors. Availability of continuous low level of fluoride in oral fluids throughout a day decreases the threshold for demineralization. This supports the efficacy of fluoridated toothpaste when used at regular intervals during the day in preventing decay.[3]

Toothpaste and toothbrush are the most widely used oral hygiene aids.[4] Promoting oral self-care capacity and the use of fluoride toothpaste is, therefore, an appropriate strategy for the control of dental caries in developing countries.

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Received: 28-01-2019 **Accepted:** 24-07-2019

Access this article online

Quick Response Code:

Website: www.jiaphd.org

DOI: 10.4103/jiaphd.jiaphd_10_19

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How to cite this article: Lalithambigai G, Rao A, Rajesh G, Shenoy R, Pai MB. Dental health behavior pertaining to fluoridated toothpaste usage among the parents of private and government school students in Mangalore, South India. J Indian Assoc Public Health Dent 2019;17:218-23.

The Tripartite Model of Anxiety and Depression states that parents may serve as teachers and supervisors providing information for their children (e.g., about dental care) and grant all the conditions and necessities so that they can have an adequate oral health (e.g., toothbrush, toothpaste, and regular dental visits).[5]

A direct relationship between socioeconomic status (such as parent's oral health and type of school), health beliefs, and oral health behavior has been established. Studies have reported using type of school as a proxy measure for an individual socioeconomic status.[6]

Targeting oral health programs to change the parental beliefs and attitudes can establish good routines and behaviors in childhood which, once established, can endure throughout adulthood.[7] To impart knowledge and to target behavioral change, it is important to assess the existing knowledge of the parents regarding toothbrushing behavior.

Thus, the present study aimed to assess the dental health behavior pertaining to fluoride toothpaste and toothbrushing behavior among parents of 12-year-old private and government school-going children in Mangalore, South India.

The null hypothesis was that there is no significant difference in the oral health knowledge and behavior pertaining to fluoride toothpaste and toothbrushing behavior in target population.

Materials and Methods

An observational questionnaire study was conducted among parents of 12-year-old schoolchildren in Mangalore to assess the dental health behavior pertaining to toothpaste use.

The number of schools with students aged 12 years in Mangalore was obtained from the block educational officer. A cluster random sampling was done. Two private and three government schools were selected randomly until the required sample was obtained. Estimating the knowledge among the parents to be 86%,[8] the sample size was calculated using the following formula: $n = 4pq/l^2$ (allowable error at 5%), and the sample size came to be 523 participants.

The questionnaire was translated to the vernacular language for administering it in government schools, and their reliability was assessed using kappa statistic (0.8). The questionnaire contained semi-structured questions of various domains to assess the knowledge about the presence of fluoride in the toothpaste and its effect, factors influencing the toothpaste selection and behavior pertaining to oral hygiene practice of their children (frequency and the amount of toothpaste used), and reasons for changing the toothpaste.

The questionnaires and informed consent forms were given to the students to be given to their parents by a single investigator. The children were given the forms at school and were asked to take the forms home and have their parents or guardian fill them in. The children were asked to bring back the completed questionnaires to school, which were collected back by the first investigator.

Only fully completed questionnaires with informed consent were included in the study. Written informed consent and the filled questionnaires were collected after 2 days.

Permission to conduct the study was obtained from the head of the institution and the principals of the selected schools. Ethical clearance to conduct the study was obtained from the institutional ethics committee (MCODS/198/protocol ref no. 11078).

Statistical analysis

The baseline characteristics of the study participants were expressed as frequencies and percentages using IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA). Bivariate analysis of the association of dental health behavior and the type of the school was conducted using Chi-square test. Finally, we fitted a multivariate binary logistic regression model to estimate the strength of association between dental health behavior and the independent variables, which is expressed as odds ratios (ORs) with 95% confidence intervals (95% CIs). To control for confounding, the final model included those variables that had $P < 0.05$ in the bivariate analysis. Dummy variables constructed for this purpose were knowledge about the effect of fluoride (0 = others, 1 = strengthen the teeth), usage of fluoridated toothpaste (0 = no, 1 = yes), instruction on toothpaste usage (0 = others, 1 = dentist), factors influencing toothpaste selection (0 = others, 1 = dentist), frequency of brushing (0 = others, twice daily = 1), amount of toothpaste used (0 = others, 1 = pea size), and reason for changing toothpaste within the last 3 months (0 = others, 1 = dentist's advice).

Results

The sample consisted of 523 participants, out of which 283 (54.1%) were male and 240 (45.9%) were female. The distribution of dental health behavior of the target population based on the type of the school of their children reported that among the participants, 99.6% were using toothpaste and 96.4% felt that brushing with toothpaste is important. Nearly 68.3% (357) of the participants have heard about fluoride in the toothpaste. Almost 22.4% of the participants knew that fluoride strengthens the teeth, 24.8% and 19.9% among government and private schools, respectively [Table 1].

Regarding the acquaintance about toothpaste usage, among government schools, majority of the target group received instructions from the dentist, whereas in private schools, most of them received instructions from their parents and family ($P < 0.001$).

Among the study participants, significantly higher number gave dentist advice (69.6%) and promotional offers (47%) as important factors in toothpaste selection in private and government schools, respectively. Around 10% reported that any toothpaste is comfortable for their usage.

Majority of the parents (74.4%) said that their children brushed twice daily. Nearly 53.2% (56.4% government and 49.8%) of the participants reported that half-a-brush head toothpaste was

Table 1: Univariate analysis of dental health behavior of fluoridated toothpaste and its association with the type of school (government/private)

	n (%)	Type of school		*P*
		Government school, *n* (%)	Private school, *n* (%)	
Gender				
Male	283 (54.1)	145 (54.5)	138 (53.7)	0.861
Female	240 (45.9)	121 (45.5)	119 (46.3)	
Toothpaste	521 (99.6)	264 (99.2)	256 (99.6)	0.616
Others	2 (0.4)	2 (0.8)	1 (0.4)	
Heard of fluoride in toothpaste				
Yes	357 (68.3)	182 (68.4)	174 (67.7)	0.467
No	166 (31.8)	84 (31.6)	83 (32.3)	
Effect of fluoride on teeth				
Makes teeth whiter	81 (15.5)	20 (7.5)	61 (23.7)	0.001*
Strengthens the teeth	117 (22.4)	66 (24.8)	51 (19.9)	
Cleans the teeth	133 (25.4)	95 (35.7)	38 (14.8)	
Freshness of mouth	51 (9.8)	12 (4.5)	39 (15.2)	
Don't know	141 (27.0)	73 (27.4)	68 (26.5)	
Effect of fluoride				
Strengthens the teeth	113 (21.6)	65 (24.4)	48 (18.7)	0.067
Others	410 (78.4)	201 (75.6)	209 (81.3)	
Instructions on toothbrush usage				
Not received instructions	28 (5.4)	12 (4.5)	16 (6.2)	0.001*
From parents	284 (54.3)	108 (40.6)	176 (68.5)	
Dental surgeons	168 (32.1)	112 (42.1)	56 (21.8)	
From advertisements	30 (50.7)	21 (7.9)	0.9 (3.5)	
From others	13 (2.5)	13 (4.9)	-	
Reason for choosing toothpaste				
Price	19 (3.6)	12 (4.5)	7 (2.7)	0.001*
Taste	44 (8.4)	28 (10.5)	16 (6.2)	
Advertisement	31 (5.9)	21 (7.9)	10 (3.9)	
Promotional offer	131 (25.0)	125 (47)	6 (2.3)	
Dentist's advice	234 (44.7)	55 (20.7)	179 (69.6)	
Any other toothpaste	49 (9.4)	24 (9)	25 (9.7)	
Others	10 (1.9)	1 (0.4)	9 (3.5)	
Quality	4 (0.8)	-	4 (1.6)	
Freshness	1 (0.2)	-	1 (0.4)	
Frequency of brushing				
Once	105 (20.1)	75 (27.8)	30 (11.7)	0.001*
Twice	389 (74.4)	175 (65.8)	214 (83.3)	
Thrice	16 (3.1)	6 (2.1)	10 (3.9)	
Others	13 (2.5)	10 (3.8)	3 (1.2)	
Amount of toothpaste used for brushing				
Pea size	76 (14.5)	44 (16.5)	32 (12.5)	0.004*
Half-a-brush head toothpaste	278 (53.2)	150 (56.4)	128 (49.8)	
Full-head toothpaste	154 (29.4)	61 (22.9)	93 (36.2)	
Others	15 (2.9)	11 (4.1)	4 (1.6)	
Using fluoridated toothpaste				
Yes	499 (95.4)	261 (98.1)	238 (92.6)	0.006*
No	24 (4.6)	5 (1.9)	19 (7.4)	
Reason for changing toothpaste				
None	353 (67.5)	219 (82.3)	134 (52.1)	0.001*
High price	14 (2.7)	-	14 (5.4)	
Bad taste	19 (3.6)	5 (1.9)	14 (5.4)	

Contd...

Table 1: Contd...

	n (%)	Type of school		*P*
		Government school, *n* (%)	Private school, *n* (%)	
Bad advertisement	4 (0.8)	-	4 (1.6)	
Dentist's advice	94 (18)	24 (9)	70 (27.3)	
Any toothpaste is fine	28 (5.4)	13 (4.9)	15 (1.9)	
Others	10 (1.9)	-	15 (1.9)	
Quality	1 (0.2)	-	1 (0.4)	

*Statistically significant, Chi-square test

Table 2: Multivariate analysis of dental health behavior of fluoridated toothpaste and its association with the type of school (government/private)

Characteristics	OR	95.0% CI	*P*
Effect of fluoride**			
Strengthens the teeth	0.933	0.801–1.086	0.369
Others	1		
Usage of fluoridated toothpaste**			
Yes	6.041	1.929–18.919	0.002*
No	1		
Instruction on toothpaste usage**			
Dentist's advice	4.630	2.770–7.741	0.001*
Others	1		
Factors influencing toothpaste selection**			
Dentist's advice	0.113	0.072–0.177	0.001*
Others			
Frequency of brushing**			
Twice daily	0.371	0.937–1.703	0.125
Others	1		
Amount of toothpaste**			
Pea size	1.263	1.141–1.424	0.001*
Others	1		
Changed toothpaste within the last 3 months**			
Yes	1.275	1.141–1.424	0.561
No	1		

**Coded variables: Effect of fluoride (0=others, 1=strengthen the teeth); Usage of fluoridated toothpaste (0=no, 1=yes); Instruction on toothpaste usage (0=others, 1=dentist); Factors influencing toothpaste selection (0=others, 1=dentist); Frequency of brushing (0=others, twice=1); Amount of toothpaste (0=others, 1=pea size); Changed toothpaste within the last 3 months (0=others, 1=dentist's advice) with type of school (government/private), *Statistically significant. 1 – Reference category, CI – Confidence interval, OR – Odds ratio

used by their children for cleaning the tooth, whereas only 14.5% used pea-sized toothpaste.

Regarding the usage, 98.1% and 92.6% of government and private school parents, respectively, were using fluoride toothpaste, which was found to be statistically significant ($P < 0.001$).

The key factor influencing the change in toothpaste selection was nothing (67.5%) followed by dentist's advice (9% and 27.3%) among parents of private and government schools, respectively ($P < 0.001$).

Multivariate logistic regression analysis showed that private school students had higher odds of brushing twice a day (OR – 6.04 [95% CI: 1.929–18.912]), using pea-sized toothpaste (OR – 1.26 [95% CI: 1.141–1.424]), the fact of their parents receiving instructions from dentist on toothpaste usage (OR – 4.63 [95% CI: 2.770–7.741]), and dentist's advice (OR – 0.113 [95% CI: 0.072–0.177]) as major factors in selecting toothpaste, whereas students of government schools had lesser odds of using fluoridated toothpaste and brushing twice daily [Table 2].

Discussion

Dental caries follows a "nutcracker pattern" with increasing prevalence of dental caries among developing countries and *vice versa* for developed countries.[9-13] Although the reasons for this are complex, the consensus view is that the greater availability of fluoride through water fluoridation and increased use of fluoridated toothpastes were the most significant factors for improved control of dental caries in developed countries.[14]

Treatment of dental caries makes dentistry an expensive profession. Among the preventive strategy, toothbrushing (with fluoridated toothpaste) is the most cost-effective tool in preventing dental caries.[15] The World Health Organization continues to emphasize the effective use of fluoride for the prevention of dental caries as an important public health measure and highly recommends the introduction of affordable fluoride toothpastes in developing countries.[16]

Oral health behavior of an individual is greatly reflected by his/her own experiences, cultural perceptions, familial beliefs, and other life situations. According to the Tripartite Model of Anxiety and Depression, parents grant all the conditions and necessities for their children, so that they can have an adequate oral health (e.g., toothbrush, toothpaste, and regular dental visits).[17]

Evidence suggest that socioeconomic circumstances have strong influences on well-being and health across the lifespan.[18] In a study conducted by Goel *et al*., government school students had higher odds for dental caries.[19] Hence, in the present study, type of school (government and private) has been used as a proxy measure to assess the socioeconomic status of the students.

Many studies have addressed the relationships between mother's or parent's socioeconomic status, health beliefs, and children's oral health behavior, but none have been comprehensively reported in the Indian population. Hence, the present study was conducted to assess the dental health behavior pertaining to fluoride toothpaste and toothbrushing behavior among parents of 12-year-old private and government schoolgoing children in Mangalore, South India.

Regarding oral hygiene practices in the present study, toothpaste and toothbrush were the most commonly used oral hygiene aids used akin to the reports among the schoolchildren in other developing countries.[20-22] In the present study, 99.6% of the participants used toothbrush and toothpaste, par with the study done in Ambala[20] and Bhaktapur,[23] whereas only 87% of indigenous Chepang schoolchildren[24] and 71.4% of Panchkula students used toothbrush and toothpaste to clean their teeth.[25]

In a study done among 23 countries, regarding the usage of fluoridated toothpaste, the percentage varied from 91.9% to 100%, which is in consonance with the present study (95.4%).[26] Tay and Jaffar reported that majority of the respondents (84.3%) were aware about the beneficial effect of fluoridated toothpaste in oral health.[27] Another study done among the Swedish population[28] revealed that a substantial proportion of parents had knowledge about the effect of fluoride in toothpaste, whereas in the present study, only 21.6% were aware of it; in particular, parents of government schools thought that it helps to clean the teeth. Hence, the knowledge concerning the fluoridated paste remains suboptimal in the target population.

Multivariate logistic regression revealed the prime source of factor in selecting toothpaste was dentist's advice and promotional offers. Promotional offer being the heading factor in selecting toothpaste among the parents of government schools indirectly indicates their socioeconomic status and cultural attitude.

In this study, dentist's advice was the most significant factor in selecting toothpaste. Many studies revealed that factors, in ascending order, influencing consumers' buying behavior were advertisement with celebrities, friends' advice, and parental influence. Hence, adequate awareness when created through mass media can improve the usage pertaining to fluoridated toothpaste.[28-30]

Although dentist's advice was reported to be a major factor in selecting the toothpaste, majority of the government school parents reported the usage of nonfluoridated toothpaste. This indicates the disadvantage of questionnaire study where participants are tempted to answer a correct question whether they follow it or not.

In the present study, 74.4% reported twice brushing (66% among government schoolchildren vs. 83% among private schoolchildren); this was higher than 24% reported among schoolchildren in Nepal[23] and 27.1% among 12- and 15-year-old schoolchildren in Ambala.[19]

The parents are influential figures in determining their children's dental behavior such as the kind of toothbrush, the amount of toothpaste used, and the pattern of brushing. Furthermore, the earlier the influence, the more likely it will determine the attitude and behavior of their children, which may be difficult to change later in life.

In this study, majority (53.2%) reported that the amount of toothpaste their children used during toothbrushing was half length (56% government school vs. 50% in private school) [Table 1]. Those who claimed that their children used a pea-sized amount of toothpaste comprised 14.5%, which was lesser than those reported by Tay and Jaffar among Malaysian parents (19%).[27] This indicates the need of oral health promotion movement in the target population.

Although majority of the parents have reported to receive instruction about toothpaste usage from a dentist, the incorrect size of toothpaste dispensing may be due to the influence by commercial television advertisements on toothpaste usage which usually depict full-length application of toothpaste on the toothbrush. Another reason may be that participants would have been biased as "dentist" was given as an option in the questionnaire.

Significant difference was found in dental health behavior with respect to socioeconomic status. Private schoolchildren were found to have higher odds for using fluoridated toothpaste and dentist's advice as influential factors in selecting toothpaste, whereas government school students were found to have lesser odds for receiving advice from dentist on toothpaste selection, which indicates that the brushing behavior was in line with the conflict model.

The null hypothesis was thus rejected because the present study reported a significant difference in the knowledge and behavior pertaining to fluoride toothpaste among parents of private and government schoolchildren.

Limitations of the study

- Self-administered questionnaire was the only used instrument; hence, it does not rule out overreporting and social desirability bias
- Background fluoride level was not assessed
- Finally, no information was obtained regarding the person who answered the questionnaire.

In this study, period of toothpaste use for the past 3 months was assessed; hence, it is impossible that the toothpaste being used at the time of the survey period simply happened to be either fluoridated or nonfluoridated.

Conclusions

The present study reveals that more than two-third of the study population were unaware of the fluoride use. The dental health behavior of government schoolchildren was not in par with that of private schoolchildren in fluoridated toothpaste usage and receiving instructions from dentist.

Promotional offer being the major factor influencing toothpaste selection, social marketing techniques and media campaigns can be utilized as a mass communication strategy to raise awareness among public to improve using fluoride toothpaste efficiently.

Creating awareness is a part of social responsibility of toothpaste companies. Hence, intersectoral coordination between dental team and this corporate responsibility should be properly tapped and comprehensively drafted.

In a developing country like India where centralized water fluoridation is a dream and consumers have high degree of family orientation, creating awareness and acceptability of fluoridated toothpaste in nonfluoridated zone seems to be a doable method of primary prevention against dental caries.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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