



Parental Knowledge, Attitudes, and Perception on Fluoridated Toothpaste Use in Children: A Cross-Sectional Study from Goa, India

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KEYWORDS

Fluoride, toothpaste, toothbrushing, parental knowledge, oral hygiene, caries prevention

ABSTRACT:

Introduction: Dental caries remains one of the most prevalent chronic diseases in childhood, and parental knowledge and practices play a crucial role in determining children's oral health outcomes. Fluoridated toothpaste is a key preventive measure; however, limited data exist regarding parents' understanding and use of fluoride toothpaste in India. This study assessed parental knowledge, attitudes, and perception related to fluoridated toothpaste and toothbrushing behaviors in children in Goa, India.

Methods: A cross-sectional survey utilizing a pre-validated questionnaire was conducted between August and October 2025 among 250 parents of children aged ≤ 12 years. Data were analyzed using SPSS version 26. Descriptive statistics summarized categorical and quantitative variables. Chi-square tests evaluated associations between age and brushing practices, and independent t-tests compared knowledge and perception scores between mothers and fathers. Significance was set at $p < 0.05$.

Results: Only 16.8% of parents selected toothpaste based on fluoride concentration, and 88% were unaware of the fluoride content of their child's toothpaste. Half of the children used pediatric toothpaste, while 46.8% used adult toothpaste. Toothbrushing frequency was once daily for 50% of children. Recommended toothpaste quantities were followed by 45.5% of parents with children under 3 years and 42.1% of parents of 3–6-year-olds. Parental involvement decreased with increasing child age. Mothers had significantly higher knowledge and perception scores than fathers ($p < 0.05$).

Conclusions: Parents demonstrated limited awareness regarding fluoridated toothpaste, appropriate dosing, and supervised toothbrushing. Targeted educational interventions are needed to improve parental understanding, promote twice-daily brushing, ensure correct toothpaste amounts, and reduce rinsing practices to maximize fluoride benefits.

1. Introduction

Dental caries is the most common chronic disease of childhood and is a widespread health issue in majority of nations [1,2]. Overall prevalence of dental caries in India is 54.16%, whereas age-specific prevalence is 62% in patients above 18 years and 52% among 3–18 years of age [3]. Several methods have been suggested to prevent dental caries, including fluoride administration, fissure sealants, plaque control, and dietary adjustments [4].

By inhibiting demineralization and supporting the remineralization of affected areas, fluoride provides significant protection to hard dental tissues and contributes to their repair through both systemic and topical actions [5]. The Federation of Dentists International has stated that fluoride use is beneficial, safe, and effective for preventing dental caries.

Fluoride can be delivered through various methods, including community water fluoridation, fluoride-containing toothpastes, mouthrinses, and professionally applied topical fluoride treatments [6]. Current evidence demonstrates that fluoride's caries-preventive properties arise primarily from its topical action. This protective effect is strengthened when combined with effective oral hygiene measures, particularly routine brushing with fluoridated toothpaste [7-9]. Despite extensive research on fluoride's properties and established guidelines for its use in toothpaste, limited studies have examined actual patterns of fluoride toothpaste use among general population. Therefore, this study aimed to investigate the status and practices of fluoride toothpaste use in children. The survey focused on the actual use of fluoride toothpaste and the extent of parental knowledge of its benefits as well as the oral hygiene practices in children.



2. Methods

A cross-sectional survey was conducted between August and October 2025 in the Department of Pedodontics, Goa Dental College and Hospital, Goa, India. Participants included parents of children aged ≤ 12 years visiting the department. Institutional Review Board approval was secured prior to the start of the study.

The questionnaire used in this study was adopted from the instrument developed by AlAmro et al. (2023) [9]. Written informed consent was obtained from parents meeting the study's inclusion criteria, which required having a healthy child aged 12 years or below and sufficient knowledge of the child's oral hygiene routines. Parents or children who did not adhere to these criteria, or who opted out, were excluded from participation.

Sample size was calculated based on a pilot study conducted on 40 participants. With 95% confidence level and margin of error 5%, sample size was estimated to be 222. It was round off and final sample size was calculated to be 250.

The questionnaire consisted of 15 items related to demographics, the main criterion for choosing the toothpaste, frequency of toothbrushing, amount of toothpaste used, the concentration of fluoridated toothpaste, and parent's supervision. The amount of toothpaste dispensed was presented to the participants through pictures (Figure 1) [9].

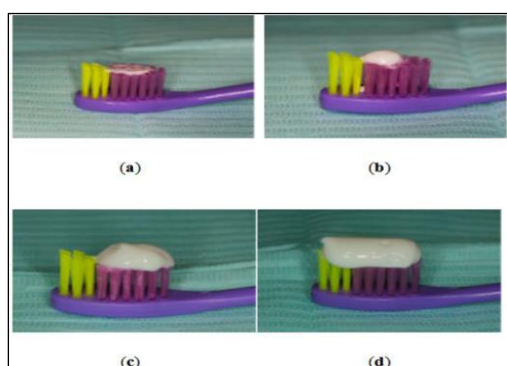


Figure 1 [9]: Amount of dispensed toothpaste: (a) Smear (b) Pea-size (c) Half-load (d) Full-load

Data was tabulated using Microsoft® Excel® 2021 MSO (Version 2510). Data analysis was performed using

Statistical Package for the Social Sciences (SPSS) 26th version. Frequency and percentages were used to display categorical variables. Minimum, maximum, mean, and standard deviation was used to display quantitative variables. Independent t-test was used to compare knowledge and perception score between parents. Chi square test was used to find association between age of the child and amount of toothpaste used as well as parental involvement in child's toothbrushing. Knowledge and perception scores for each participant were calculated based on their answers to the questions: high level if the score was more than 75% of the total score, moderate if the score is between 50-75%, and low if it is less than 50%. The level of significance was set at 0.05.

3. Results

Characteristics of the Study Participants

A total of 250 participants were included in the study. The demographic characteristics of participants are described in Table 1. Among the parents 156 (62.4%) were mothers and 94 (37.6%) were fathers. Of the children 43.2% were males and 56.8% were females. The age distribution among the children was as follows: 51.2% children were 0 to 6 years old while 48.8% children were 7 to 12 years old.

Table 1: Characteristics of the Study Participants

		N	%	Age Mean \pm SD
Gender of the child	Female	142	56.8%	7.33 \pm 2.9
	Male	108	43.2%	6.32 \pm 205
Age Groups	0-6 years	128	51.2%	
	7-12 years	122	48.8%	
Relation with the child	Father	94	37.6%	
	Mother	156	62.4%	

(N: frequency; %: percentage; SD: standard deviation)



Participants' perception and knowledge level

The assessment of participants' perception of the use of fluoridated toothpaste in children is shown in Table 2. The minimum perception score was 0, the maximum was 3 and the mean was 1.01 ± 0.976 (SD), whereas the minimum knowledge score was 0 and maximum was 6, with mean value of 2.14 ± 1.407 (SD). Only 16.8% parents chose fluoride concentration as their main criterion for selecting the child's toothpaste, whereas 43.3% of the participants based their choice on the brand. Table 3 presents the assessment of parental knowledge regarding the use of fluoridated toothpaste in children. Half of the parents reported that their child used a children's toothpaste, while 46.8% indicated the use of

adult toothpaste. Additionally, 35% of parents were unsure whether the toothpaste contained fluoride, and 88% did not know the fluoride concentration of the product used. Parents reported that 49.2% of children brushed their teeth twice per day, while 50% brushed once daily.

Low perception scores were recorded in 71.2% of participants, with 19.2% displaying moderate perception and 9.6% showing high perception. Knowledge scores followed a similar trend: 66.4% of parents had low knowledge, 25.6% had moderate knowledge, and only 8% achieved high knowledge. Data from the present study shows that mothers scored significantly higher in knowledge and perception scores compared to fathers.

Table 2: Assessment of participants' perception of the use of fluoridated toothpaste in children

Question		N	%	Chi-square (χ^2)	p-value
What is the main criterion for selecting toothpaste for your child?	Price	7	2.8%	136.72	< 0.001
	Brand	113	45.2%		
	Taste	65	26.0%		
	Fluoride concentration	42	16.8%		
	Media and advertisements	23	9.2%		
Do you get involved in your child's teeth brushing?	Always	133	53.2%	103.66	< 0.001
	Sometimes	72	28.8%		
	Rarely	13	5.2%		
	Never	32	12.8%		
How do you get involved in your child's toothbrushing?	Remind my child to brush	90	36.0%	37.17	< 0.001
	Watch my child brush	54	21.6%		
	Brush my child's teeth	78	31.2%		
	Not involved	28	11.2%		

(N: frequency; %: percentage)

Participants' involvement in child's toothbrushing

Parental involvement varied, with 12.8% reporting no participation and 53.2% indicating consistent involvement in their child's toothbrushing. Among parents who did participate, a minority (31.2%) brushed their child's teeth directly, while the others offered support through supervision or verbal reminders. In children less than 3 years of age, 63% brushed their children's teeth by themselves, and the remaining participants were involved either by watching or reminding their children to brush. For children between

the age of 4 and 6, 37.4% of the participants brushed their child's teeth. As for the participants with children who are 7-12 years of age, majority of the participants reminded their children to brush. Table 4 illustrates how parental involvement and the quantity of toothpaste dispensed varied among the different age groups of children.

Amount of toothpaste used across different children's age groups

For children below 3 years, appropriate smear-sized amounts were used in only 45.5% of cases, with an equal



proportion receiving a pea-sized amount. In the 3–6-year category, 42.1% used the recommended pea-size. Among children aged 7–12 years, 37.2% were given a pea-sized amount, while 45.5% received a half-load of toothpaste.

Table 3: Assessment of participants’ knowledge of the use of fluoridated toothpaste in children

		N	%	Chi-square (χ^2)	p-value
What toothpaste does your child use?	Adult toothpaste	117	46.8%	106.44	< 0.001
	Children’s toothpaste	126	50.4%		
	Not sure	7	2.8%		
Have you ever heard of fluoride?	Yes	73	29.2%	96.84	< 0.001
	No	139	55.6%		
	Not sure	38	15.2%		
What is the amount of toothpaste that your child uses?	Smear size	40	16.0%	54.96	< 0.001
	Pea size	100	40.0%		
	Half load	88	35.2%		
	Full load	22	8.8%		
Does your child use fluoridated toothpaste?	Yes	89	35.6%	17.16	< 0.001
	No	72	28.8%		
	Not sure	89	35.6%		
Do you know what is the concentration of	1000-1500ppm	16	6.4%	562.14	< 0.001
	450-500 ppm	7	2.8%		

fluoride in your child’s toothpaste?	Non-fluoridated	7	2.8%		
	Not sure	220	88.0%		
How many times a day does your child brush his/ her teeth?	Once a day	125	50.0%	120.96	< 0.001
	Twice a day	123	49.2%		
	More than twice a day	1	0.4%		
	Sometimes but not every day	1	0.4%		
What does your child do after teeth brushing?	Rinse with water	238	95.2%	646.64	< 0.001
	Spit out without rinsing	6	2.4%		
	Swallow toothpaste while brushing	4	1.6%		
	Not sure	2	0.8%		

(N: frequency; %: percentage)

Table 4: The difference in participants’ involvement and amount of toothpaste used across different children’s age groups

Factor	Age of the child			
		0-3 years old	4-6 years old	7-12 years old
		N (%)	N (%)	N (%)
How do you get involved in your child’s toothbrushing	Remind my child to brush	4 (18.2%)	30 (28%)	56 (46.3%)
	Watch my child	4 (18.2%)	31 (29%)	19 (15.7%)



	brushing			
	Brush my child's teeth	14 (63.6%)	40 (37.4%)	24 (19.8%)
	Not involved	0 (0)	6 (5.6%)	22 (18.2%)
What is the amount of toothpaste the child uses	Smear-size	10 (45.5%)	21 (19.6%)	9 (7.4%)
	Pea-size	10 (45.5%)	45 (42.1%)	45 (37.2%)
	Half-load	2 (9.1%)	31 (29.6%)	55 (45.5%)
	Full-load	0 (0)	10 (9.3%)	12 (9.9%)

(N: frequency; %: percentage)

4. Discussion

Brushing teeth twice a day with a suitable amount of age-appropriate fluoride toothpaste is the fundamental measure for preventing dental caries [10]. As primary caregivers, parents strongly influence their child's oral hygiene behavior and practices, hence they must be properly guided to provide appropriate dental care for their children. A lack of adequate knowledge of oral health among parents can ultimately compromise the oral health of their children [11,12]. Caries incidence in children can be significantly reduced by improving parental knowledge and awareness regarding oral health [13,14] Hence the aim of this study was to assess the knowledge, perception and attitude of parents regarding the use of fluoridated toothpastes and toothbrushing habits in children.

Fluoridated toothpaste

In the present study, when asked about the type of toothpaste used, only half the participants reported the use of a pediatric toothpaste. Remaining participants either used adult's toothpaste or were unsure about the

type of toothpaste used. For 45.2% participants, the main criterion for selecting a toothpaste was 'brand' while only 16.8% participants chose 'fluoride concentration' as the primary criterion for selecting a toothpaste. In our study, 55.6% of the participants had heard about fluoride which contrasts with the outcomes reported in a study by Vijai et al. who found that more than 80% of parents had heard of fluoride [15]. Only 35.6% participants in the current study reported that their child's toothpaste contained fluoride. However, Hwang et al. found that 84.5% of children brushed with fluoride toothpaste, while 96.4% of parents regarded it as necessary for their children [6]. The results of the present study are similar to the findings by Alshehri and Kujan, who reported that only 29.2% children used fluoridated toothpaste [16] These findings highlight the need to enhance parental awareness about appropriate toothpaste choices along with reinforcing oral hygiene recommendations.

Fluoride concentration

Walsh et al, in their 2019 Cochrane Review, examined fluoride toothpastes of varying concentrations and found that caries incidence reduced as fluoride content increased. The evidence of moderate to high certainty indicated that toothpastes with at least 1000 ppm fluoride outperform non-fluoride toothpaste in reducing caries incidence among children [17]. The European Academy of Paediatric Dentistry (EAPD) in 2009 has recommended the use of toothpaste with 1000ppm fluoride for children below 6 years of age and toothpaste containing 1450ppm fluoride for children above 6 years of age [7]. According to World Health Organization, children's toothpaste should contain at least 1000ppm of fluoride and no more than 1500ppm of fluoride [18]. Hwang et al reported that 42.3% participants were aware of the fluoride content however in the present study 88% parents were unaware of the fluoride concentration in their child's toothpaste [6]. These results reflect a gap in parental understanding of current guidelines concerning fluoridated toothpaste and the age-appropriate fluoride concentration suitable for children. Therefore, enhancing their awareness regarding proper toothpaste selection is essential.

Amount of toothpaste

Fluoride-related safety concerns persist among the public, mainly because excessive intake can cause



adverse effects such as diarrhea, vomiting, toxic reactions, and skeletal or dental fluorosis [4,8,19]. Children younger than six are more susceptible because their swallowing reflex is not fully developed. Those under three years are at even higher risk, as this is a key period for permanent tooth hard tissue formation, increasing the chance of fluorosis. Adverse outcomes associated with fluoride are typically seen only with excessive intake. In order to minimize potential adverse effects, the ADA and EAPD, among other bodies, recommend age-specific usage of fluoride toothpaste for infants and young children [7,10]. According to these guidelines, smear or rice grain size toothpaste should be used for children under the age of 3 years and pea-sized amount should be used for children between ages 3 to 6 years. In the present study, only 45.5% of the children younger than 3 years old used the correct amount of toothpaste while 42.1% of the participants dispensed the recommended amount for the age group of 3 to 6 years. These findings were consistent with those found by Sudradjat et al. who concluded that the parents used significantly higher amount of toothpaste for their children and were unaware about conditions of use [20]. The results imply that parents misunderstand how much toothpaste is necessary for effective caries prevention. Therefore, dentists should provide anticipatory guidance and conduct oral health awareness programs to educate parents.

Parental involvement in toothbrushing

Ensuring that children brush twice a day with fluoridated toothpaste under parental supervision provides a simple, evidence-based, and highly effective measure for preventing early childhood caries [21]. Although parents understand that brushing is important, many still let their children brush on their own too early, rather than maintaining parental guidance [22]. Duijster et al. found a strong correlation between caries experience at 6 years and the lack of parental involvement in brushing [23]. Guidelines recommend that parents brush their children's teeth and supervise tooth brushing until children are 10 years old [24]. In the present study, only 53.3% parents were always involved in their child's toothbrushing. It was found that, in children below 3 years of age, 63% participants brushed their children's teeth and the remaining participants were involved either by watching or reminding their children to brush.

However, for children between the ages of 4 and 6 years, only 37.4% of the participants brushed their child's teeth. As for the participants with children who are 7-12 years of age, majority of the participants reminded their children to brush. These findings were consistent with those found by Bennadi et al. who found that 83% children didn't practice supervised toothbrushing and Elkarmi et al. who reported that 78% parents did not brush their children's teeth [25,26]. Hence it is important to emphasize supervised toothbrushing among parents, as young children lack the fine motor skills and dexterity for proper brushing and are unable to completely expectorate the toothpaste.

Frequency of toothbrushing

Regular toothbrushing at least twice a day is significantly associated with low caries incidence and enhanced gingival health in children [27]. In the present study, 49.2% participants reported that their children brush teeth twice a day and 50% children brushed their teeth only once a day. These findings are similar to those by Alyousef et al. who reported that 45.5% children brushed their teeth twice daily while 54.5% children brushed once a day [28]. In a global health survey conducted across 72 countries, Gupta et al. found that, 90% participants brushed their teeth at least once a day but only the region of the Americas had the highest frequency of brushing twice or more daily [29]. This pattern demonstrates a widespread lack of awareness regarding the role of brushing frequency in oral health. As a result, it is crucial to provide comprehensive oral hygiene guidance and reinforce the recommendation of brushing twice daily.

Rinsing after brushing

Research on the clearance of salivary fluoride indicates that elevated fluoride levels in oral fluids contribute to a sustained protective effect against dental caries [30]. Hence, present recommendations emphasize avoiding excessive rinsing with water after toothbrushing so that fluoride can persist in the oral environment and provide extended caries protection [7,31]. In the present study, majority of participants (95.2%) reported that children rinsed their mouth with water after brushing which was consistent with the findings by Bennadi et al. who stated that 84% children practiced rinsing with water after brushing [26]. Refraining from rinsing post-brushing effectively increases fluoride exposure and aids in caries



prevention, making it an important recommendation to highlight in oral hygiene guidance.

Limitations

This was a single-center, hospital-based study conducted in a dental college setting, which may not be representative of the general community or other regions of India.

Data were obtained through self-reported questionnaires, which are subject to recall bias and social desirability bias, particularly for questions related to brushing frequency and supervision. The study did not include clinical examination or caries indices, so parental knowledge and practices could not be directly correlated with actual oral health status.

Potential confounders such as socioeconomic status, parental education level, and access to dental care were not deeply explored, which may influence knowledge and behaviour.

Future Prospects

Multi-center, community-based studies with larger and more diverse samples across different regions of India are needed to better generalize these findings.

Future research should integrate clinical oral health assessments (e.g., dmft/DMFT, plaque and gingival indices) to directly link parental knowledge, attitude and perception with children's caries and periodontal status.

Qualitative research (e.g., focus groups or in-depth interviews) could further explore barriers, misconceptions, and cultural beliefs influencing parents' decisions about fluoridated toothpaste.

Development and evaluation of context-specific educational tools (posters, videos, digital apps, school-based programs) involving dentists, pediatricians, and community health workers could help improve parental awareness and promote evidence-based home care practices.

5. Conclusion

This cross-sectional study showed that parents generally had low levels of knowledge and perception regarding the appropriate use of fluoridated toothpaste in children. Many parents based toothpaste selection on brand and

taste rather than fluoride content, were unaware of the fluoride concentration, and frequently dispensed amounts that exceeded age-based recommendations. Although just over half of the parents reported being consistently involved in their child's toothbrushing, direct parent-led brushing declined markedly with increasing child age, and most children brushed only once daily and rinsed with water after brushing. These findings highlight the need for targeted parental education on fluoridated toothpaste use, age-appropriate amounts, supervised toothbrushing, optimal brushing frequency, and minimal rinsing to maximize fluoride's caries-preventive effect.

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