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Original Article

Correlation Between Brushing Frequency and Self-Reported Dental Problems Among School Students in Hyderabad: A Cross-Sectional Study

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ABSTRACT

Background: Toothbrushing is a key preventive oral hygiene behavior among schoolchildren, yet oral health complaints may remain common when brushing frequency, brushing technique, or toothbrush selection is inadequate. Objective: To determine the association between toothbrushing frequency, toothbrush bristle type, and self-reported dental problems among school-going children in Hyderabad, Sindh, Pakistan. Methods: This observational cross-sectional study was conducted among 387 school-going children from February 2026 to May 2026 using a structured questionnaire. Data were collected on demographic characteristics, brushing habit, toothbrushing frequency, toothbrush bristle type, and self-reported dental problems, including gingival bleeding, tooth sensitivity, toothache, tooth decay, and discoloration. Categorical variables were summarized as frequencies and percentages. Associations between oral hygiene variables and self-reported dental problems were assessed using the Chi-square test, with $p<0.05$ considered statistically significant. Results: Of 387 participants, 242 were male and 145 were female. Self-reported dental problems were present in 260 participants. Gingival bleeding was the most frequent complaint, followed by tooth sensitivity and toothache. Toothbrushing frequency was significantly associated with self-reported dental problems, $\chi^2=20.698$, $p<0.001$, based on 372 valid responses. Toothbrush bristle type was also significantly associated with dental problems, $\chi^2=7.031$, $p=0.030$. Conclusion: Infrequent brushing and hard-bristled toothbrush use were associated with a higher prevalence of self-reported dental problems. School-based oral health education should emphasize regular brushing, appropriate toothbrush selection, and early dental consultation. Keywords: Oral Hygiene; Toothbrushing; Dental Problems; Schoolchildren; Gingival Bleeding; Toothbrush Bristles; Cross-Sectional Study.

INTRODUCTION

Oral health during childhood is a major component of general health, school participation, nutrition, psychosocial well-being, and quality of life. School-going children represent a particularly important population for oral health promotion because oral hygiene practices established during this period often continue into adolescence and adulthood. Toothbrushing is the most widely recommended and practical method for maintaining oral hygiene, as it mechanically removes dental plaque and reduces the accumulation of microbial biofilm on tooth surfaces. Inadequate plaque control contributes to the development and progression of common oral health problems, including dental caries, gingival inflammation, tooth sensitivity, halitosis, and periodontal complaints (1–5).

Dental caries remains one of the most prevalent oral health conditions affecting children and adolescents. It can cause pain, difficulty in chewing, school absenteeism, impaired daily functioning, and, when untreated, infection or tooth loss. Preventive oral health measures, including regular toothbrushing with appropriate technique, reduced sugar intake, and use of fluoride toothpaste, are inexpensive and effective public-health strategies for reducing preventable dental morbidity among children (6–8). Schools provide an appropriate setting for oral health education because they allow repeated reinforcement of preventive behaviors, teacher involvement, peer-based learning, and linkage with parental supervision. Evidence suggests that school-based oral health promotion can improve children's understanding of plaque control and encourage healthier oral hygiene behavior (9).

Toothbrushing frequency is an important behavioral indicator in epidemiological assessment of oral hygiene. Although clinical oral hygiene indices provide more objective measurement, self-reported toothbrushing practices are frequently used in population-based studies because they are simple, low-cost, and feasible in large school settings. Previous studies from Pakistan and other settings have reported variable toothbrushing practices among children and young adults, reflecting differences in age, awareness, socioeconomic conditions, school environment, parental supervision, and access to oral health information (10–14). In addition to brushing frequency, toothbrush bristle type may influence oral health complaints. Soft, medium, and hard-bristled toothbrushes differ in plaque-removal efficiency, tissue contact, and potential for abrasion or gingival trauma, particularly when combined with excessive brushing force or poor technique (15–17).

Despite the established importance of toothbrushing, limited local evidence is available regarding the relationship between brushing frequency, toothbrush bristle type, and self-reported dental problems among school-going children in Hyderabad, Sindh. Local data are important because oral hygiene behavior may vary across regions due to differences in school health education, family practices, socioeconomic background, dietary habits, and access to dental care. Understanding these associations can help guide school-based oral health education programs and preventive strategies tailored to the needs of children in this population. Therefore, this study aimed to determine the association between toothbrushing frequency, toothbrush bristle type, and self-reported dental problems among school-going children in Hyderabad, Sindh, Pakistan.

MATERIALS AND METHODS

An observational cross-sectional study was conducted among school-going children in Hyderabad, Sindh, Pakistan, from February 2026 to May 2026. The study was designed to assess oral hygiene practices and self-reported dental problems at a single point in time and to evaluate the relationship of toothbrushing frequency and toothbrush bristle type with reported oral health complaints. Participants were recruited using a non-probability convenience sampling technique. Students who were available during the data-collection period, agreed to participate, and provided complete responses to the study questionnaire were included.

Data were collected using a structured, self-administered questionnaire developed to obtain information on demographic characteristics, toothbrushing practices, toothbrushing frequency, toothbrush bristle type, and self-reported dental problems. The questionnaire included items on whether participants brushed their teeth, how frequently they brushed, the type of toothbrush bristles they used, and whether they experienced oral health complaints. Self-reported dental problems were assessed through participant responses regarding toothache, tooth sensitivity, gingival bleeding during brushing, tooth decay, and tooth discoloration. The primary outcome variable was the presence of any self-reported dental problem, categorized as "problem" when at least one oral health complaint was reported and "no problem" when no complaint was reported. The main explanatory variables were toothbrushing frequency and toothbrush bristle type, categorized according to participant responses.

Participation was voluntary, and confidentiality of the collected information was maintained throughout the study. Data were checked for completeness and consistency before analysis. The final analyzed sample consisted of 387 school-going children. Variables were analyzed using the relevant valid denominator for each analysis. Gender, toothbrush bristle type, and overall self-reported dental problems were analyzed using the total sample of 387 participants, while toothbrushing-frequency analysis was conducted using 372 valid responses. Categorical variables were summarized as frequencies and percentages. The association between toothbrushing frequency and self-reported dental problems was assessed using the Chi-square test. The association between toothbrush bristle type and self-reported dental problems was also assessed using the Chi-square test. Statistical analysis was performed using Statistical Package for Social Sciences version 26. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 387 school-going children were included in the final analysis. Of these, 242 participants were male and 145 were female. Toothbrushing-frequency data were available for 372 participants. Among these participants, once-daily brushing was the most commonly reported frequency, followed by twice-daily brushing. Soft-bristled toothbrushes were the most frequently used toothbrush type, followed by medium- and hard-bristled toothbrushes.

Table 1. Demographic and Oral Hygiene Characteristics of Participants

Variable	Category	n	%
Gender	Male	242	62.5
	Female	145	37.5
Brushing frequency	Twice daily	133	35.8
	Once daily	163	43.8
	Occasionally	51	13.7
	Weekly	18	4.8
	Thrice daily	7	1.9
Toothbrush bristle type	Soft	216	55.8
	Medium	95	24.5
	Hard	76	19.6

Overall, males represented 62.5% of the sample and females represented 37.5%. Among participants with available toothbrushing-frequency data, once-daily brushing was reported by 43.8%, twice-daily brushing by 35.8%, occasional brushing by 13.7%, weekly brushing by 4.8%, and thrice-daily brushing by 1.9%. Soft-bristled toothbrushes were used by 55.8% of participants, whereas 24.5% used medium-bristled and 19.6% used hard-bristled toothbrushes.

Self-reported dental problems were present in 260 participants, while 127 participants reported no dental problems. Gingival bleeding during brushing was the most frequently reported complaint, followed by tooth sensitivity and toothache. Tooth decay and tooth discoloration were also reported.

Table 2. Frequency of Self-Reported Dental Problems Among Participants

Variable	Category	n	%
Self-reported dental problem	Present	260	67.2
	Absent	127	32.8
Type of dental complaint	Gingival bleeding during brushing	90	23.3
	Tooth sensitivity	88	22.7
	Toothache	88	22.7
	Tooth decay	72	18.6
	Tooth discoloration	68	17.6

Self-reported dental problems were present in 67.2% of participants. Gingival bleeding during brushing was reported by 23.3% of the total sample, while tooth sensitivity and toothache were each reported by 22.7%. Tooth decay was reported by 18.6%, and tooth discoloration was reported by 17.6%.

Toothbrushing frequency showed a statistically significant association with self-reported dental problems. The proportion of participants reporting dental problems was lower among once-daily and twice-daily brushers and higher among those who brushed occasionally or weekly. Dental problems were also reported by all participants in the thrice-daily brushing category.

Table 3. Association Between Toothbrushing Frequency and Self-Reported Dental Problems

Brushing Frequency	Problem n (%)	No Problem n (%)	Total n	χ^2	p-value
Twice daily	82 (61.7)	51 (38.3)	133	20.698	<0.001
Once daily	103 (63.2)	60 (36.8)	163		
Occasionally	45 (88.2)	6 (11.8)	51		
Weekly	16 (88.9)	2 (11.1)	18		
Thrice daily	7 (100.0)	0 (0.0)	7		

Among participants with valid toothbrushing-frequency data, self-reported dental problems were present in 61.7% of those who brushed twice daily and 63.2% of those who brushed once daily. The prevalence was higher among participants who brushed occasionally and weekly, with dental problems reported by 88.2% and 88.9%, respectively. Dental problems were reported by all participants in the thrice-daily brushing category. The association between toothbrushing frequency and self-reported dental problems was statistically significant, $\chi^2 = 20.698$, $p < 0.001$. Toothbrush bristle type was also significantly associated with self-reported dental problems. Participants using hard-bristled toothbrushes had the highest proportion of reported dental problems, while those using medium-bristled toothbrushes had the lowest proportion.

Table 4. Association Between Toothbrush Bristle Type and Self-Reported Dental Problems

Toothbrush Bristle Type	Problem n (%)	No Problem n (%)	Total n	χ^2	p-value
Soft	149 (69.0)	67 (31.0)	216	7.031	0.030
Medium	54 (56.8)	41 (43.2)	95		
Hard	57 (75.0)	19 (25.0)	76		

Self-reported dental problems were present in 75.0% of participants using hard-bristled toothbrushes, compared with 69.0% of those using soft-bristled toothbrushes and 56.8% of those using medium-bristled toothbrushes. The association between toothbrush bristle type and self-reported dental problems was statistically significant, $\chi^2 = 7.031$, $p = 0.030$.

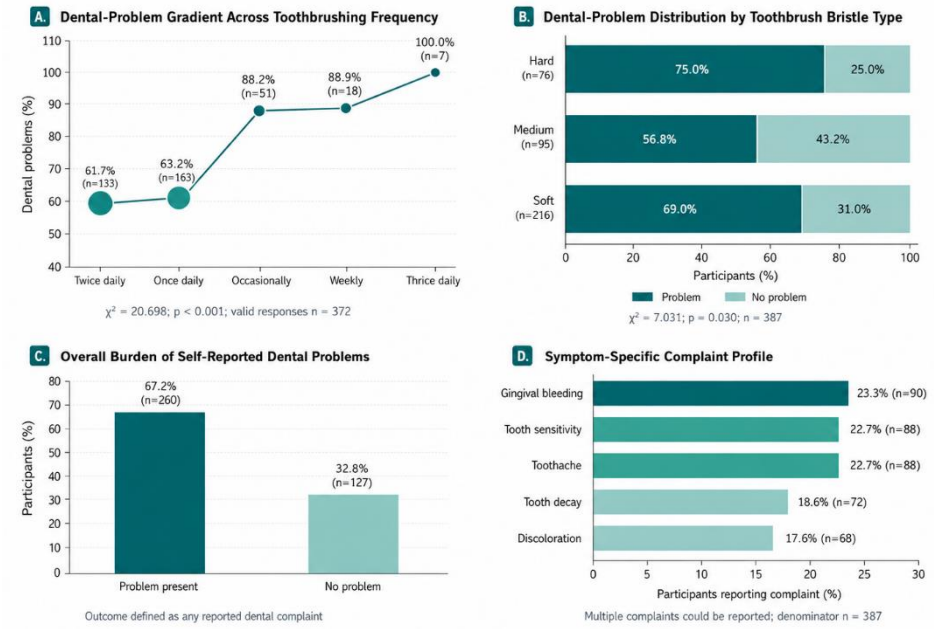

Figure 1 Toothbrushing Practices, Toothbrush Bristle Type, and Self-Reported Dental Problems Among School Students.

Panel A shows a clear dental-problem gradient across toothbrushing frequency, with reported problems increasing from 61.7% among twice-daily brushers and 63.2% among once-daily brushers to 88.2%

among occasional brushers, 88.9% among weekly brushers, and 100.0% among thrice-daily brushers; the association was statistically significant, $\chi^2 = 20.698$, $p < 0.001$. Panel B shows that dental problems were most frequent among hard-bristled toothbrush users at 75.0%, followed by soft-bristled users at 69.0% and medium-bristled users at 56.8%, with a significant association between bristle type and dental problems, $\chi^2 = 7.031$, $p = 0.030$. Panel C summarizes the overall burden, with 260 of 387 participants reporting at least one dental problem. Panel D shows that gingival bleeding was the most common complaint, followed by tooth sensitivity and toothache. Brushing-frequency analysis was based on 372 valid responses because the supplied brushing-frequency categories did not sum to the full sample of 387.

DISCUSSION

The present study found a significant association between toothbrushing frequency and self-reported dental problems among school-going children in Hyderabad. Although most participants reported brushing their teeth, self-reported dental problems remained common, with 260 of 387 participants reporting at least one oral health complaint. Gingival bleeding during brushing, tooth sensitivity, and toothache were the most frequently reported problems, indicating that oral health complaints were not limited to caries-related symptoms but also included possible gingival and sensitivity-related concerns. These findings suggest that brushing frequency alone may not fully explain oral health status, as brushing technique, fluoride toothpaste use, dietary sugar exposure, dental-service access, parental supervision, and health literacy may also influence oral health outcomes.

In this study, participants who brushed occasionally or weekly reported a higher prevalence of dental problems than those who brushed once or twice daily. This pattern is consistent with the biological role of toothbrushing in mechanical plaque control, as inadequate plaque removal can contribute to gingival inflammation, caries development, tooth sensitivity, and other oral complaints. The finding is also consistent with previous evidence that toothbrushing frequency can be used as a practical behavioral indicator in epidemiological assessment of oral hygiene, particularly where clinical oral indices are not feasible (14). However, because the present study was cross-sectional, the observed association should not be interpreted causally. It is also possible that reverse causality contributed to some findings, particularly in the small thrice-daily brushing group, where all seven participants reported dental problems. Children with existing oral symptoms may brush more frequently in response to discomfort, parental instruction, or perceived oral health concerns rather than frequent brushing being the cause of symptoms.

The brushing pattern observed in this study is broadly comparable with previous Pakistani studies reporting variable oral hygiene practices among children and young adults. A study from Lahore reported toothbrushing habits among schoolchildren aged 10 to 18 years, while studies from Karachi, Quetta, and other Pakistani settings have shown differences in brushing frequency across age groups, educational backgrounds, and population characteristics (10–13). These variations may reflect differences in parental involvement, school-based oral health education, socioeconomic conditions, urban–rural background, and access to preventive dental guidance. The present findings add local evidence from Hyderabad and highlight the need for context-specific oral health promotion rather than relying only on general recommendations.

Toothbrush bristle type was also significantly associated with self-reported dental problems. Hard-bristled toothbrush users reported the highest prevalence of dental problems, while medium-bristled toothbrush users reported the lowest prevalence. This finding is clinically relevant because toothbrush bristle stiffness may influence both cleaning efficiency and tissue effects. Hard bristles may remove plaque effectively in some circumstances, but they may also increase the risk of gingival trauma, enamel wear, or dentinal hypersensitivity, especially when used with excessive brushing force or improper technique. Previous evidence has suggested that bristle stiffness and brushing force can influence

cleaning efficacy and tooth or soft-tissue effects, supporting the need to educate children not only about brushing frequency but also about appropriate toothbrush selection and brushing method (15,17).

The high frequency of gingival bleeding, tooth sensitivity, and toothache in the present sample suggests that school-based oral health programs should address both preventive and symptom-recognition components. Children should be taught to brush at least twice daily with appropriate technique, avoid aggressive brushing, use age-appropriate soft or medium toothbrushes, and seek dental evaluation when symptoms such as bleeding gums, toothache, or sensitivity are present. Parental supervision is also important because children may report brushing but still use ineffective technique, insufficient duration, excessive force, or inappropriate toothbrushes. Integrating oral health education into school health programs may therefore help improve knowledge, behavior, and early referral for dental care (9).

This study has important limitations. First, dental problems were self-reported rather than confirmed through clinical oral examination, which may have introduced reporting error, recall bias, or misclassification. Second, the use of non-probability convenience sampling limits generalizability beyond the included schools and participants. Third, the study did not assess dietary sugar intake, fluoride toothpaste use, brushing technique, brushing duration, socioeconomic status, parental education, dental-service utilization, or previous oral health education, all of which may confound the relationship between brushing behavior and dental complaints. Fourth, the brushing-frequency categories available for analysis totaled 372 participants rather than the full sample of 387, so the denominator for this analysis should be clearly reported and verified before final submission. Future studies should use probability-based sampling, include clinical oral examinations, apply standardized oral health indices, assess diet and fluoride exposure, and evaluate brushing technique and parental supervision to provide a more comprehensive understanding of oral health determinants among schoolchildren.

CONCLUSION

This study demonstrated a significant association between toothbrushing frequency, toothbrush bristle type, and self-reported dental problems among school-going children in Hyderabad, Sindh, Pakistan. Self-reported dental problems were common, particularly gingival bleeding during brushing, tooth sensitivity, and toothache. Children who brushed occasionally or weekly reported a higher prevalence of dental problems than those brushing once or twice daily, while hard-bristled toothbrush users reported more dental problems than users of soft or medium bristles. These findings support the need for school-based oral health education programs emphasizing regular toothbrushing, appropriate toothbrush selection, correct brushing technique, parental supervision, and timely dental consultation for oral symptoms. Because the study used a cross-sectional design and self-reported outcomes, the findings should be interpreted as associations rather than causal effects.

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