

Original Article

BEHAVIORAL CORRELATES OF ORAL HEALTH STATUS AMONG SCHOOLCHILDREN IN KARACHI, PAKISTAN: A CROSS-SECTIONAL STUDY

Alessa Uqaily¹, Renoka Kumari¹, Muhammad Bilal¹, Sana Mirza², Uzma Zareef³

¹Institute of Dentistry, Liaquat University of Medical and Health Science, Jamshoro Sindh, Pakistan

²Department of Oral Pathology, Liaquat University of Medical and Health Sciences, Jamshoro Sindh, Pakistan

³Department of Oral Pathology, Liaquat College of Medicine and Dentistry, Karachi, Pakistan

ABSTRACT

Objectives: This study aimed to evaluate the association between lifestyle behaviors, traditional practices, and oral health status among schoolchildren.

Materials and Methods: A cross-sectional study was conducted among 142 students aged 10–18 years at a government school in Karachi, Pakistan. Behavioral information was collected through a structured interviewer-administered questionnaire assessing tooth brushing frequency, floss use, dietary habits, betel nut consumption, stress-related neglect of oral care, and traditional practices such as miswak use. Clinical oral examinations were performed following World Health Organization (WHO) criteria to record gingival bleeding and tooth sensitivity. Data were analyzed using SPSS version 26. Descriptive statistics and chi-square tests were applied, with statistical significance set at $p < 0.05$.

Results: Dental caries were present in 46.5% of participants, while 41.5% reported tooth sensitivity and 38% exhibited gingival bleeding. A significant association was observed between brushing frequency and dental caries ($p = 0.007$). Gingival bleeding was also significantly associated with tooth sensitivity ($p = 0.027$). No statistically significant association was observed between dental caries and betel nut consumption, miswak use, or snack frequency.

Conclusion: Oral hygiene behaviors, particularly tooth brushing frequency, were the most important determinants of oral health status among schoolchildren. The findings highlight the need for strengthened school-based oral health education and preventive interventions aimed at improving daily hygiene practices.

Key words: Oral Health; Dental Caries; Schoolchildren; Oral Hygiene; Behavioral Factors

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INTRODUCTION

Oral diseases are among the most prevalent chronic health conditions affecting children globally, with dental caries and gingival diseases contributing

to pain, missed educational opportunities, and diminished quality of life¹. In Pakistan, recent meta-analytic evidence estimated the national prevalence of dental caries among children to be 56.6%, with figures for Sindh province at approximately 58.9%². Localized surveys show even higher burdens, reporting 74% prevalence in Quetta³ and as high as 91.3% among 5- to 11-year-old children in Karachi's Ibrahim Hyderi community⁴. Research spanning multiple regions shows clear links between these eating patterns and dental problems in young populations. Findings from large-scale reviews support this con-

Correspondence:

Sana Mirza

Professor

Department of Oral Pathology, Liaquat University of Medical and Health Sciences, Jamshoro Sindh, Pakistan

Email: sana.mirza@lumhs.edu.pk

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nection without ambiguity⁵. These results show that more research is necessary to completely understand how daily activities and environmental factors affect children's dental health in learning settings.

Alongside diet, lifestyle choices also have an impact on oral health: sedentary behavior and prolonged screen time are associated with poor brushing habits, distracted eating, and a higher consumption of cariogenic snacks, while family routines and parental supervision have a major influence on daily oral care. These behavioral linkages make schools a logical setting to both measure and intervene on multiple, interacting lifestyle risk factors^{5,6}.

In addition to sugar intake, dental health is influenced by physical activity and dietary quality. The role that systemic health and overall nutritional status play in the development of oral disease is highlighted by population-level analyses that link children and adolescents' increased caries risk to low levels of physical activity and inadequate dietary intake of essential minerals (like calcium)⁷. This evidence implies that multi component lifestyle assessments not only frequency of sugary snacks but also diet quality and activity patterns are important when investigating caries and periodontal outcomes in school cohorts⁷⁻¹⁰.

Alongside these modern lifestyle determinants, traditional oral care practices persist in many communities and may affect clinical status in both protective and adverse ways. Recent randomized trials and meta-analyses show that oil pulling and chewing sticks made from *Salvadora persica* (miswak) can lower microbial load and occasionally perform similarly to traditional toothbrushing for plaque control, though results vary by technique and user training, and some studies report greater gingival abrasion or recession when misused¹¹. The frequency, implementation and cultural acceptance of traditional methods must be evaluated in order to accurately interpret clinical data and develop culturally relevant suggestions¹².

Despite growing evidence regarding behavioral determinants of oral diseases, context-specific data from school populations in Pakistan remain limited. Understanding how lifestyle behaviors and traditional oral practices influence oral health outcomes is essential for designing effective school-based preventive programs^{13,14}. Therefore, the objective of

this study was to evaluate the association between lifestyle behaviors, traditional oral practices, and oral health status among schoolchildren in Karachi, Pakistan.

MATERIALS AND METHODS

This cross-sectional study was conducted among schoolchildren aged 10–18 years at Narayan Jagannath Vaidya High School in Karachi from September 2025 to December 2025.

A minimum sample size of 138 participants was calculated using the WHO sample size formula for prevalence studies, considering a 95% confidence level, 5% margin of error, and an anticipated prevalence of dental caries of 56.6% based on previously published national data from Pakistan¹. The final study included 142 participants, which satisfied the minimum required sample size for analysis.

A structured questionnaire-based strategy, combined with a clinical oral examination, was applied for data collection. The questionnaire was pilot tested on 40 participants before the actual study, those 40 responses were not included in the final data of the study. The questionnaire consisted both closed-ended and multiple-choice questions designed to assess oral hygiene behaviors, lifestyle patterns (including betel nut use, dietary behaviors, and stress-related factors), traditional practices (such as miswak use, salt rinses, and home remedies), and self-reported oral health results. Clinical examinations were performed using sterile mouth mirrors and probes under natural light following WHO oral health survey guidelines.

The study was approved ethically by the Research Ethics Committee of Liaquat University of Medical and Health Sciences (LUMHS/REC/-1128). Written informed consent was obtained from parents/guardians, and verbal consent was taken from the children. Participation was completely voluntary, and all answers were kept completely private. Throughout the reporting and publication process, no personally identifiable information was revealed.

Participants were recruited using convenience sampling from students aged 10–18 years who were present during data collection and whose parents or guardians provided informed consent were included in the study. Students undergoing orthodontic treatment, those with systemic illnesses affecting oral health, and participants with incomplete question-

naire responses were excluded.

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics including frequencies and percentages were calculated for the age, gender, residence. Social habits, oral hygiene habits and oral health conditions. Associations between categorical variables such as oral hygiene habits and dental caries and oral health symptoms were assessed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULT

A total of 142 students participated in the study. Majority of the participants were between age category 13–15 years and 78.9% were males. Most students reported brushing once daily (51.4%), while only a small proportion reported using dental floss (4.9%) or miswak (2.1%). Dental caries were observed in 46.5% of participants, while 41.5% reported tooth sensitivity and 38% had gingival bleeding. Demographic data of the participants are summarized in table 1.

Chi-square analysis demonstrated a statistically significant association between brushing frequency and dental caries (p = 0.007). Association between oral hygiene habits and dental caries are summarized in Table 4. Association between oral health symptoms are also present in Table 4.

DISCUSSION

This study investigated the influence of lifestyle behaviors and traditional practices on oral health outcomes among schoolchildren. The findings demonstrated that dental caries, gingival bleeding, and tooth sensitivity were relatively common among participants. Among the evaluated factors, tooth brushing frequency showed the strongest association with dental caries, highlighting the central role of regular oral hygiene practices in maintaining oral health among adolescents.

These findings are consistent with previous epidemiological studies indicating that inadequate tooth brushing contributes significantly to plaque accumulation and increased risk of dental caries and periodontal conditions. Behavioral determinants such as oral hygiene practices have been repeatedly identified as key predictors of oral health outcomes in school-aged populations.

Table 1: Demographic characteristics of participants (n = 142)

Variable	Category	N	%
Age (years)	10-12	14	9.9
	13-15	87	61.3
	16-18	41	28.9
Gender	Male	112	78.9
	Female	30	21.1
Residence	Hostler	116	81.7
	Day Scholar	26	18.3

Table 2: Social habits and oral-hygiene practices

Variables	Category	N	%
Brushing frequency	Multiple/day	60	42.3
	Once/day	73	51.4
	Occasional/none	9	6.3
Dental floss use	Yes	7	4.9
	No	135	95.1
Miwak use	Yes	3	2.1
	No	139	97.9
Snack frequency	None	47	33.1
	1–2/day	87	61.3
	≥ 3/day	8	5.6
Neglect brushing when stressed	No	36	25.4
	Sometimes	69	48.6
	Often	37	26.1
Use of home remedies	Yes	29	20.4
	No	113	79.6
Oral habits	Betel nuts	51	35.9
	Tobacco	2	1.4
	None	89	62.7
Dental-treatment concerns	Has concern	111	78.2
	No concern	31	21.8

Table 3: Prevalence of oral-health conditions

Variable	Category	N	%
Dental caries status	Has dental problem	66	46.5
	No dental problem	76	53.5
Tooth sensitivity	Yes	59	41.5
	No	83	58.5
Gum bleeding	Yes	54	38.0
	No	88	62.0
Tooth Discoloration/Staining	Yes	27	19.0
	No	115	81.0
Bad breath	Present	5	3.5
	Not Present	137	96.5

Table 4: Association Between Oral Hygiene Habits and Dental Caries and oral health symptoms

Variables Tested	χ^2 Value	df	p-value
Brushing frequency × Dental caries	9.802	2	0.007*
Snack frequency × Dental caries	0.689	2	0.709**
Miswak use × Dental caries	0.502	1	0.479**
Gender × Dental caries	0.894	1	0.345**
Gum bleeding × Tooth sensitivity	4.893	1	0.027*
Oral habits × Tooth discoloration	1.461	1	0.227**
Toothache × Dental caries	2.642	1	0.104**
Stress neglect × Oral hygiene	3.068	1	0.080**
Floss use × Dental caries	2.180	2	0.336**

*significant, ** not significant

The results of this study show that caries, gum bleeding, and tooth sensitivity are common among teenage students at NJV Government School. Despite awareness of oral hygiene importance, there remains a gap between knowledge and Regular practice, a trend also reported in earlier national and international studies¹⁵⁻¹⁷. Most participants brushed once daily, while very few used dental floss or traditional aids such as miswak¹⁵, indicating incomplete oral care routines comparable to findings from similar populations in Karachi and other developing regions^{15,19,20}.

The frequency of brushing was strongly associated with dental caries; this indicates the importance of regular brushing and maintaining oral hygiene. Other studies have also found similar results that infrequent brushing leads to increases plaque accumulation and risk of dental caries²¹. This adds evidence from a regional meta analysis on adolescents showing tooth brushing and preventive behaviours as key caries determinants²². Some past studies also suggested that snack frequency and diet pattern are important factors affecting oral health. Similar observations show that frequent sweet snacks and poorer dietary habits are associated with increased caries risk in school-aged children^{23,24}. However in this study no clear association was observed between these factors and oral health outcomes²⁵. Hostel residents’ eating habits and supervision may influence outcomes.

As compared with regional findings, The prevalence of dental caries, along with associated problems including bleeding gum and tooth sensitivity,

was lower than that reported in urban populations from Karachi¹⁷ but greater figures were observed in rural environment This may be explained by the hostel environment with limited supervision. These regional variations across Pakistan shows the significant role of lifestyle and environmental factors affecting health outcomes²⁶.

A significant connection was observed between gum bleeding and tooth sensitivity. According to previous studies, students who experienced gum bleeding are at greater risk to report tooth sensitivity²⁷. Academic pressure and hostel living conditions may influence oral hygiene behaviors²⁸. Furthermore, the continued practice of betel nut chewing among participants aligns with earlier reports documenting harmful oral habits among South Asian adolescents²⁹.

This study has several limitations. The cross-sectional design prevents establishing causal relationships between lifestyle behaviors and oral health outcomes. The study was conducted in a single school using a relatively small sample size, which may limit the generalizability of the findings and the ability to perform advanced multivariable regression analyses. Additionally, some behavioral data were self-reported and may be subject to recall bias. Future research should involve larger multi-center studies with longitudinal designs to better understand causal pathways and evaluate the effectiveness of school-based oral health interventions.

CONCLUSION

This study highlights that oral hygiene behaviors, particularly tooth brushing frequency, play a critical role in determining oral health status among schoolchildren. While several lifestyle and traditional practices were assessed, their influence on oral health outcomes was limited compared with daily hygiene practices. These findings emphasize the importance of implementing structured school-based oral health promotion programs aimed at improving preventive behaviors and reducing the burden of oral diseases among children..

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.

AUTHORS' CONTRIBUTION

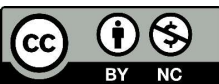
The following authors have made substantial contributions to the manuscript as under:

Conception or Design: AU, RK, MB, SM, UZ

Acquisition, Analysis or Interpretation of Data: AU, RK, MB, SM, UZ

Manuscript Writing & Approval: AU, RK, MB, SM, UZ

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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