Original Research Article
Journal of Kathmandu Medical College, Vol. 14, No. 1, Issue 51, Jan.-Mar., 2025

Prevalence and correlates of dental caries among school children in eastern Nepal: A cross-sectional study

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ABSTRACT

Introduction: Dental caries is a major public health concern for children's health and well-being in Nepal.

Objectives: To investigate the prevalence of dental caries and its links to oral hygiene and socioeconomic status among schoolchildren.

Methodology: An analytical cross-sectional study was conducted from December 2024 to February 2025 among 352 school children aged 6-12 years in Phidim, Panchthar district. Data were collected by the trained dentist using a structured questionnaire and clinical examinations to determine the Decayed, Missing, and Filled Teeth (DMFT/df) index. Ethical approval was obtained from the Institutional Review Committee of Kathmandu University School of Medical Science (IRC No. 252/23). Statistical analysis included descriptive statistics, Pearson's correlation, and logistic regression.

Results: The prevalence of caries was high, particularly in the 6-9 year age group 209 (59.3%) in primary dentition. A significant knowledge-practice gap was identified: while most children 336 (95.5%) knew sugary food was harmful, 348 (98.9%) were unaware of the correct brushing technique. Consequently, 280 (79.5%) required prompt or immediate dental treatment. Socioeconomic status (SES) showed significant negative correlation with the DMF index ($\rho = -0.135$, $p = 0.011$). For each one-year increase in age, the adjusted odds of having caries in permanent molars increased by 23% (aOR = 1.23, $p < 0.001$).

Conclusion: The study highlights a critical burden of untreated dental caries in this paediatric population, driven primarily by inadequate oral hygiene knowledge rather than a lack of brushing attempts. The findings underscore an urgent need for targeted, school-based public health programs.

Keywords: Dental Caries; Oral Hygiene; Prevalence; School Children

Access this article online

Website: www.jkmc.com.np

DOI: https://doi.org/10.3126/jkmc.v14i1.92436

HOW TO CITE
Prajapati D, Ojha B, Lamichhane K, Mahanta SK, Shrestha N. Prevalence and correlates of dental caries among school children in eastern Nepal: A cross-sectional study. J Kathmandu Med Coll. 2025;14(1):16-21.

Submitted: Jul 27, 2025
Accepted: Jan 7, 2026
Published: Jan 29, 2026

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ISSN: 2019-1785 (Print), 2091-1793 (Online)

INTRODUCTION

Oral diseases constitute a major global health burden, with dental caries being one of the most prevalent conditions, particularly affecting children.[1-4] The World Health Organization estimates that caries impacts 60–90% of school-aged children worldwide, posing a significant threat to their growth and development.[5,6] While the incidence of dental caries has declined in developed nations, it is paradoxically on the rise in many low-income countries. [7] This increase is frequently linked to modifiable risk factors, including diets high in refined carbohydrates and inadequate oral hygiene practices, such as the insufficient use of fluoridated toothpaste. [8,9]

The prevalence of dental caries in the eastern Nepal were 60.3% and 55.6% in the primary and permanent dentition, [10] whereas worldwide trending high risk of caries.[11] Many children understand the importance of good oral hygiene but fail to consistently implement effective brushing and dietary habits, thereby underestimating the risks to their health. [12] This disparity underscores an urgent need for

targeted, evidence-based interventions. Therefore, the present study aims to determine the prevalence of dental caries in a pediatric population and to determine its association with key risk factors, including oral hygiene practices and socioeconomic variables, to inform future public health strategies.

METHODOLOGY

An analytical cross-sectional study was conducted to determine the prevalence of dental caries and observed its pattern among the students. This study was conducted in Phidim municipality of Panchthar district among school children of age group 6 to 12 years from December 2023 to March 2024. Children from one government and three private schools who gave assent and brought informed consent were included in the study. Students with systemic diseases, having fixed orthodontic appliances and absent at the time of examination were excluded. Sample size was determined based on the formula: z^2pq/e^2 Where, z is 1.96 (confidence interval - CI = 95%), ε is the margin of error = 5% = 0.05, p̂ is the population proportion = Study done by Subedi et al [13] at Kathmandu among school children, prevalence of dental caries = 69 % = 0.69, q= 1- p̂ = 0.31. The minimum sample size estimated was 327. Actual Sample size in the study was 352. Convenient sampling technique was used.

American Dental Association (ADA) type 3 examination was done where data were collected using interviewer-led structured questionnaires and clinical examinations performed by trained dentists. The World Health Organization [14] Oral Health Assessment form was used to gather information on oral health. During the intraoral examination, dental caries experience was recorded in structured format using the DMFT (Decayed, Missing, and Filled Teeth) index by Klein, Palmer, and Knutson. The study protocol received ethical approval from the Institutional Review Committee of Kathmandu University School of Medical Sciences (IRC No. 252/23). Statistical analysis was performed using IBM SPSS Statistics for Windows version 25 (IBM Corp., Armonk, N.Y., USA). Descriptive statistics were used to summarize sociodemographic data, while Correlation analysis was used to assess the relationship between dental caries, socioeconomic status (SES), and the number of siblings. Logistic regression test was used to determine association between age and caries status of permanent molars.

RESULTS

The study population consisted of 352 6-12 years aged school children among them 182 (51.7%) were male and 170 (48.3%) were female. Children were recruited from four schools in the Pachthar district: Vidhya Bardan Secondary School 128 (36.4%) Naya Namuna Secondary School 68 (19.3%) , Nilkantha Secondary School 47 (13.4%), and Phidim Secondary School 109 (31%) . The socioeconomic distribution of participants was divided into five groups, primarily lower group 27 (7.7%), upper lower 58 (16.4 %), lower middle-income group 123 (34.9%), Upper middle-income group 113 (32.1%) and upper class 31 (8.8%). The prevalence of dental caries varied significantly with age and dentition. Among children aged 6-9 years, caries prevalence was 209 (59.3%) in primary teeth and 93 (26.42%) in permanent teeth. For the 10–12-year age group, the corresponding rates were74 (21%) and 90 (25.5%) respectively. The average number of siblings per student was two ranging from 1-5 (Table 1)

A questionnaire on oral health knowledge and practices revealed several key points. While most students 336 (95.5%) knew that sugary foods are harmful to teeth, nearly all were unaware of proper brushing techniques 348 (98.9%) or the function of fluoride 345 (98%). More than half of the children 183 (52.3 %) had never visited a dentist. For those who had, tooth extraction was the reason for the visit in 98 (27.8%) of cases. Regarding current symptoms, 118 (33.5%) of students reported having tooth pain, and 61 (17.3%) noticed their gums bleeding during brushing. Despite these issues, the majority of children reported brushing their teeth regularly, with only 34 (9.7%) who did not brush or only brushed occasionally (Table 2).

Among all the permanent first molar lower left permanent molar has high prevalence of dental caries 126 (36%) whereas upper left first permanent molar had dental caries 65 (17.4%). An evaluation of treatment need showed that a large percentage of students required dental care. Specifically, 134 (38%) needed immediate treatment for pain or infection, 146 (41.5%) needed prompt treatment, and 46 (13.1%) needed preventive care. The mean primary decayed tooth is 4.62 ± 3.56 with range of 0-14 and mean permanent decayed tooth is 1.29 ± 1.63 with the range of 0-8 (Table 3).

Spearman's correlation shows associations between deciduous (df) and permanent (DMF) caries experience with socioeconomic status (SES) score and number of siblings. There was a significant negative correlation between SES and DMF ($\rho = -0.135$, $p = 0.011$), which indicates lower caries prevalence in permanent teeth among higher socioeconomic groups. DMF also showed

a significant positive correlation with number of siblings ($\rho = 0.147$, $p = 0.006$, table 4)

Univariate and multivariate logistic regression analyses were conducted on a sample of 324 children to determine the association between age and the caries status of permanent first molars. The multivariate model revealed a significant association between age and dental caries ($p < 0.001$) after adjusting for socioeconomic score. For each one-year increase in age, the adjusted odds of having dental caries increased by 23% (Adjusted Odds Ratio = 1.23, Table 5)

Table 1: Sociodemographic characteristics and Prevalence proportion of dental caries of the participants

Variables	n (%)	df n (%)	DMFT n (%)
Age			
6-9	229 (65.1)	209 (59.3)	93 (26.42)
10-12	123 (34.9)	74 (21.02)	90 (25.5)
Gender			
Male	182 (51.7)	143 (40.60)	81 (23.01)
Female	170 (48.3)	140 (39.77)	102 (28.9)
School Information			
1 Vidhya Bardan Secondary School	128 (36.4)	121	70
2 Naya Namuna Secondary School	68 (19.3)	30	49
3 Nilkantha Secondary School	47 (13.4)	43	18
4 Phidim Secondary School	109 (31)	81	46
Socioeconomic status (Modified Kuppuswamy Scale)[15]			
Upper	31 (8.8)	22 (71)	22 (71)
Upper middle income	113 (32.1)	99 (78)	66 (38.4)
Lower middle income	123 (34.9)	98 (79.7)	56 (55.5)
Upper lower	58 (16.4)	80 (86.2)	30 (51.7)
Lower	27 (7.7)	22 (81.5)	9 933.3)

df: Primary decayed tooth DMFT: Permanent decayed tooth

Table 2: Oral health knowledge experience and practices among the children

Items	n (%)
Do you know proper brushing technique?	
Yes	4 (1.1)
No	348 (98.9)
Do you know about the fluoride?	
Yes	7 (2)
No	345 (98)
Do you have gum bleeding?	
Yes	61 (17.3)
No	291 (82.7)
Do you have tooth pain (Within 1 year)	
Yes	118 (33.5)
No	234 (66.5)
Sugary food is good for teeth?	
Yes	16 (4.6)
No	336 (95.5)

Items	n (%)
Have you ever visited dental clinic/ hospital	
Yes	168 (47.7)
No	183 (52.3)
Frequencies of brushing teeth	
Occasional/ Never	34 (9.7)
Once a day	162 (46)
Twice daily	156 (44.3)
Reason to visit dental clinic/hospital (n=168)	
Extraction	98 (27.8)
Restoration	28 (7.9)
Tooth pain	42 (12)

Table 3: Prevalence of dental caries and Intervention urgency.

Variables (Tooth number)	n (%)
46 Lower right permanent first molar	126 (33.6)
36 Lower left permanent first molar	137 (36.4)
26 Upper left permanent first molar	65 (17.4)
16 Upper right permanent first molar	68 (18.1)
Intervention Urgency	
No treatment need	24 (6.8)
Preventive treatment need	46 (13.1)
Prompt treatment need	146 (41.5)
urgent(Immediate) treatment need	134 (38.1)
Type of decayed teeth	Mean ±SD
Primary decayed tooth (Range 0-14)	4.62±3.56
Permanent decayed tooth range (0-8)	1.29±1.63

Table 4: Correlation of DMF and df teeth with socioeconomic status.

Variables	Spearman's correlation	p-value
SES score and df	0.071	0.182
SES score and DMF	-0.135	0.011
df and siblings	-0.035	0.511
DMF and siblings	0.147	0.006 *

p-value significant ≤0.05, *=Spearman's correlation
SES (socioeconomic score) df: Primary decayed tooth
DMF: Permanent decayed tooth

Table 5: Association between dental caries of 1st molars and age

	Crude OR			Adjusted OR		
Variables	**OR**	**95% CI**	**P-value**	**OR**	**95% CI**	**p-value**
Permanent 1st molars						
16	Ref			Ref		
26	0.23	0.08, 0.37	0.002	0.22	0.078 ,0.372	0.003†
36	0.37	0.24, 0.50	0.000	0.36	0.23, 0.50	<0.001†
46	0.39	0.26, 0.53	0.000	0.39	0.25, 0.52	<0.001†

p-value significant ≤0.05, p-value highly significant ≤0.001†= Logistic regression, adjusting for socioeconomic status (income, education, occupation)

DISCUSSION

This study shows a significant burden of dental caries among school-aged children in the Panchthar District. A key finding was the exceptionally high prevalence of caries in the younger age group (6–9 years), which supports the study indicating dental caries starts at the very early age. [12,16,17] The mean number of decayed primary teeth (d = 4.62) was substantially higher than that of permanent teeth (D = 1.29), highlighting that the primary dentition carries the greatest disease load. [16] This is likely due to the inherent structural vulnerability of primary enamel and the challenges of establishing effective oral hygiene in young children.

Our data also identified the mandibular first molars as the most susceptible permanent teeth to caries. Their complex anatomy, with deep pits and fissures, combined with their early eruption sequence (around age 6), exposes them to a cariogenic environment, Since Oral hygiene practices are not firmly established at an early age, so these molars are at higher risk of developing early decay. This cumulative risk is reflected in our regression analysis, which showed that after adjusting for socioeconomic factors, the odds of having dental caries increased significantly with each additional year of age (aOR = 1.23, $p < 0.001$). Previous studies have shown that developing countries usually have limited

access to dental care due to which there has a higher level of plaque and calculus compared to economically developed societies [17]. Socioeconomic factors could play a significant role in dental health but present study shows no significance or correlation between socioeconomic scores with DMF/df scores.

The findings on oral hygiene practices are particularly concerning. While the vast majority of children (95.7%) reported brushing their teeth, there was a profound lack of knowledge regarding its effective application. Only 1.1% understood the correct brushing technique, and nearly half (46.9%) brushed less than the recommended once a day. This disconnect between the habit of brushing and the knowledge to do it effectively mirrors findings from other studies in developing regions, such as with ethnic Chepang children in Nepal. [5] While brushing frequency in our cohort appears similar to or better than some local reports, it falls short of practices in countries like China and Jordan, [18] where twice-daily brushing is more common. These results strongly suggest that health promotion should focus not only on encouraging brushing but critically, on providing practical education on proper technique and frequency.

This study differently stated the possible relationship between socioeconomic status (SES) and oral health. A weak but statistically significant negative correlation was found between SES and the DMF index ($p = 0.013$), suggesting that higher socioeconomic status is associated with better oral health in permanent teeth. Similarly, a weak positive correlation was observed between the number of siblings and the DMF index ($p = 0.028$), indicating that children from larger families may face a slightly higher risk of caries.

However, it is notable that SES showed no significant correlation with the caries in primary teeth. This suggests that in this population, the protective effects of higher SES may not manifest until later in childhood, or that the overwhelming risk factors in early childhood affect all children regardless of background. The weakness of these correlations implies that other factors, such as parental health literacy, cultural practices, and local availability of fluoride and dental services, likely play a crucial mediating role.

Finally, the pattern of dental service utilization highlights a critical deficiency in preventive care. The fact that a majority of dental visits (58.3%) were for tooth extractions indicates that care is predominantly sought only in response to pain or advanced disease. This problem-oriented approach, rather than a preventive one, is a hallmark of communities with limited access to routine dental check-ups and education. It explains why, despite high rates of self-reported tooth brushing, the clinical burden of disease remains so high.

This research presents region-specific data on the prevalence of dental caries among schoolchildren in eastern Nepal, using standardized WHO criteria and a substantial sample size. The inclusion of both clinical and socioeconomic factors enhances the findings' depth. However, generalizability and causal inference are constrained because the study is cross-sectional and involves convenience sampling and self-reported habits. It strongly encouraged that further longitudinal and interventional research be conducted over larger geographic areas in order to confirm and broaden these findings.

CONCLUSION

This study reveals a high prevalence of dental caries among school-children in the Panchthar District, disproportionately affecting younger children (6–9 years) and the primary dentition. The permanent mandibular first molars were identified as particularly vulnerable, likely due to a combination of their complex anatomy, early eruption into the oral cavity, and challenges in effective cleaning.

A critical finding was the significant gap between oral hygiene habits and knowledge. While most children brush their teeth, the practice is often infrequent and technically incorrect, rendering it ineffective.

Overall, the high disease burden, coupled with a problem-oriented approach to dental care (i.e., visits primarily for extractions), underscores an urgent need for preventive public health strategies. Targeted interventions, including school-based oral hygiene education, the application of Silver Diamine Fluoride and fissure sealants on first molars, and promotion of fluoride use, are essential to improve the long-term oral health of children in this region.

ACKNOWLEDGEMENT

We would like to thank Phidim Municipality, Panchthar Municipality and respective school teachers for the support and co-ordination.

Source (s) of Support: None
Conflict of interest: None

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