

Prevalence of dental caries and oral health habits among school children in Budhanikantha Municipality, Nepal

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Dental caries is the most common oral health disease among school-aged children worldwide. **Aim:** This study aims to identify the prevalence of dental caries, oral hygiene practices, and food habits among school children. **Methods:** A cross-sectional study was conducted at two secondary schools in Budhanikantha Municipality, Ward No. 2 and 12, with a total of 400 students participating. An oral examination was performed by a dentist, and decayed, missing, and filled teeth (DMFT) were used to determine the presence of dental caries. Statistical Package for the Social Sciences version 26 was used for all analyses. **Results:** Among the participants, the majority (66.3%) were aged 10-14 years, with a mean age of 13.58 years (± 1.85), and were male (57.3%). The prevalence of dental caries was 63.0%, with a mean DMFT score of 1.67 (± 1.82). Only 38.0% of participants brushed their teeth twice a day, and all used a toothbrush for brushing. Drinking tea with sugar (61%), eating sweets/candy (42%), and biscuits, cakes, and cream cakes (37.8%) were the most frequently consumed items and were consumed on a daily basis. Health-seeking behavior was poor, with the majority (32.8%) of participants not visiting the dentist within 12 months, and 22% never receiving dental care. **Conclusion:** The study reveals a high prevalence of dental caries among school children, indicating a need for improved oral health practices and healthcare utilization. The low frequency of tooth brushing and high consumption of sugary foods and drinks suggest that oral health education and promotion of healthy habits are essential.

Keywords: Dental caries. Oral hygiene. Prevalence. Schools. Nepal.

Introduction

Oral and dental health is an essential component of overall health and well-being and serves as a key indicator of quality of life. Dental caries, periodontal (gum) disease, tooth loss, oral cancer, dental trauma, noma, and birth defects such as cleft lip and palate are some of the conditions included in oral and dental health^{1,2}. Dental caries is a common process characterized by localized chemical dissolution of the tooth surface caused by acid production by dental plaque, which is frequently exposed to sugars³. It is a significant public health problem worldwide, affecting important life activities⁴.

Dental caries is the most common oral health disease in school-aged children globally, attributed to excessive sugar consumption, poor oral hygiene, lack of fluoride exposure, and insufficient healthcare utilization^{5,6}. It can cause tooth pain, discomfort, eating difficulties, tooth loss, delayed language development, and financial strain on families, impairing children's growth and functions, and leading to anxiety and fear, ultimately worsening the severity and incomplete treatment⁵.

According to the World Health Organization (WHO), 60-90% of schoolchildren worldwide have caries, with the disease being most prevalent in Asian and Latin American countries⁷. The Global Burden of Disease Study 2019 estimated that oral diseases affect nearly 3.5 billion people worldwide, with caries of permanent teeth being the most common condition². Although dental caries prevalence has decreased in many developed countries over the last three decades, it remains high in the majority of developing countries⁸. In eastern Nepal, the prevalence of dental caries is 60.30% and 55.6% in primary and permanent dentition, respectively⁹. Nepal has a high incidence of dental health problems, with limited resources and manpower being a significant constraint in policy implementation¹⁰.

The Nepalese people have lower oral health awareness and practice, primarily due to various constraints, including geo-socio-political, economic, and healthcare resources. Dental diseases such as dental caries and periodontal disease are prevalent in Nepal due to a lack of dental awareness. The oral health system in Nepal is currently transitioning. Oral hygiene is crucial in the prevention of dental caries and periodontal diseases¹¹. Therefore, this study aims to identify the prevalence of dental caries, oral hygiene practices, and food habits among school children.

Methods

Study design and area

For this study, a cross-sectional study design was adopted. The study was conducted in two different schools in Budhanilkantha Municipality, Nepal: Little Moon English Academy, located in Ward No. 2, and Shishu Milan English School, located in Ward No. 13. The selection of schools was based on the convenience of the researcher.

Study population and sample size

The study population included students from Grade 5 to Grade 10. A total of 400 students were included in the study, with 100 students from Little Moon English Academy and 300 students from Shishu Milan English School, respectively.

Data collection tools and technique

The questionnaire utilized in this study was adapted from the WHO Oral Health Surveys, 2013. It included sections on dentition status, socio-demographic information, oral hygiene and food habits practices, and health-seeking behaviors of the participants. Prior to data collection, a list of students was compiled from their daily attendance register. Qualified dentists with a Bachelor of Dental Surgery degree conducted the dental examinations. The dentists performed the examinations based on their professional expertise. "Oral health surveys: basic methods: WHO; 2013" ensured standardized evaluation. They assessed the presence of decayed, missing, and filled teeth (DMFT) and determined the dental caries status of the participants¹². In a separate room, the students underwent examinations with their class instructor and friends present. The dentist helped the participants feel less anxious by detailing what would happen in advance.

The demographic information, food habits, oral hygiene practices, and health-seeking behaviors of the students were evaluated by a researcher. Face-to-face interviews were conducted with students from grade 5 to grade 7, while students from grade 8 to grade 10 were provided with the questionnaire. Clear instructions on how to fill the questionnaire were given before distribution. Data collection took place from March 21 to March 27, 2023.

Data quality control

The collected data were reviewed and organized daily to ensure their completeness and accuracy. Proper coding and cleaning techniques were employed to enhance the accuracy of the results and to reduce the risk of errors and inconsistencies. To ensure the reliability of the questionnaire adopted from the WHO, a pilot test was conducted among 40 students in a similar area. Prior to the pilot test, a literature review was conducted, and subject experts were consulted to ensure the validity of the questionnaire. Clear instructions were provided to the pilot test participants, who completed the questionnaire in the same format that would be used in the final study.

Data analysis

The Statistical Package for the Social Sciences (SPSS) Version 26 was utilized to conduct the statistical analysis. Descriptive statistics, such as frequency, percentage, mean, and standard deviation, were employed to measure socio-demographic variables, food habits, oral hygiene practices, health-seeking behaviors, DMFT, and the prevalence of dental caries. The association between dental caries and selected variables was measured using the chi-square test, and a significance level of $P < 0.05$ was considered statistically significant.

Ethical Consideration

Ethical clearance was obtained from the Institutional Review Committee of Yeti Health Science Academy (Ref. No.2079-072), and the School granted permission for data collection. All parents of the participating respondents provided written consent, and participants were informed of their right to refuse at any time during data collection, which was guaranteed and accepted.

Results

Socio-demographic characteristics of the sample

Of the 400 participants, majority (66.3%, n=256) were aged 10-14 years, with a mean age of 13.58 years (± 1.85). The majority of participants were male (57.3%, n=229), of Janajati ethnicity (64.8%, n=259), and practiced the Hindu religion (75.8%, n=303). Most of the parents had completed basic (31.3%, n=125) or secondary education (42.5%, n=170), and their occupations were predominantly in business (32.3%, n=129) or salaried employment (32.5%, n=130) (Table 1).

Table 1. Demographic and Socioeconomic Characteristics of Study Participants

Variables	Frequency (n)	Percentage (%)
Age (mean \pm SD, years)	13.58 \pm 1.85	
Age in years		
10-14	265	66.3
15-19	135	33.8
Sex		
Male	229	57.3
Female	171	42.8
Ethnicity		
Janajati	259	64.8
Brahmin/Chhetri	108	27.0
Others*	33	8.3
Religion		
Hindu	303	75.8
Bhuddhism	69	17.3
Others**	28	7.0
Grade of the respondent		
Grade 5	76	19.0
Grade 6	55	13.8
Grade 7	66	16.5
Grade 8	78	19.5

Continue

Continuation		
Grade 9	63	15.8
Grade 10	62	15.5
Parent's education		
Cannot read and write	12	3.0
Informal Education	48	12.0
Basic (grades 1-8)	125	31.3
Secondary (grades 9-12)	170	42.5
University Education	45	11.3
Family occupation of the respondent		
Farmers	55	13.8
Business	129	32.3
Daily wage workers	86	21.5
Salaried employee	130	32.5

*Dalit, Madhesi, Muslim, **Christian and Islam

Oral hygiene practices of the sample

More than half of the participants reported cleaning their teeth once a day (57.3%, n=229), followed by twice a day (38.0%) and 2-6 times a week (4.8%). All participants used a toothbrush to clean their teeth (100.0%). The majority of participants reported using toothpaste containing fluoride (56.3%, n=225), while 20.8% did not use fluoride toothpaste and 23.0% were unsure. Additionally, most participants reported that their parents encouraged them to brush their teeth (90.5%, n=362).

Food and beverage consumption

Table 2 presents the frequency of participants' consumption of various foods and beverages. The findings show that fresh fruits are the most frequently consumed, with 32.5% (n=130) of respondents consuming them several times a week. Biscuits, cakes, and cream cakes are also quite popular, with 37.8% (n=151) of respondents consuming them every day. Sweet pies and buns are consumed less frequently, with only 7.0% of respondents consuming them several times a day. Sweets/candy is consumed every day by 42% (n=168) of respondents. Regarding beverages, tea with sugar is consumed most frequently, with 61% (n=244) of respondents drinking it every day. Soft drinks such as lemonade and Coca Cola are consumed moderately, with 24.3% (n=97) of respondents drinking them once a week. Coffee with sugar was consumed by only 18.3% (n=73) of respondents every day.

Table 2. Frequency of food and beverage consumption among participants

Variables	Frequency % (n=400)					
	Several times a day	Everyday	Several times a week	Once a week	Several times a month	Seldom/ Never
How often do you eat fresh fruits?	34 (8.5)	72 (18.0)	130 (32.5)	102 (25.5)	59 (14.8)	3 (0.8)
How often do you eat Biscuits, Cakes, and Cream cakes?	35 (8.8)	151 (37.8)	112 (28)	58 (14.5)	36 (9)	8 (2)
How often do you eat Sweet pies, Buns?	28 (7.0)	68 (17.0)	95 (23.8)	88 (22)	61 (15.3)	60 (15)
How often do you eat Jam or Honey?	16 (4)	36 (9)	73 (18.3)	72 (18)	93 (23.3)	110 (27.5)
How often do you eat Chewing gum?	69 (17.3)	138 (34.5)	118 (29.5)	43 (10.8)	14 (3.5)	18 (4.5)
How often do you eat Sweets/Candy?	63 (15.8)	168 (42)	95 (23.8)	53 (13.3)	15 (3.8)	6 (1.5)
How often do you drink Lemonade, Coca Cola or other soft drinks?	15 (3.8)	33 (8.3)	115 (28.7)	97 (24.3)	110 (27.5)	30 (7.5)
How often do you drink Tea with sugar?	44 (11)	244 (61)	37 (9.3)	28 (7)	16 (4)	31 (7.8)
How often do you drink Coffee with sugar?	32 (8)	73 (18.3)	58 (14.5)	57 (14.2)	48 (12)	132 (33)

Health Seeking Behavior

The information provided in table 3 includes the frequency of dental visits among respondents over the past 12 months, the reasons for their last dental visit, and their sources of dental health information. According to the table, a considerable proportion of respondents had not visited the dentist in the past year (32.8%, n=131) or had never received dental care (22%, n=88). Among those who had visited the dentist, the majority (62.9%, n=88) did so due to pain or trouble with their teeth, gums, or mouth. The table also shows that teachers (22.5%) and textbooks (21%) were the most common sources of dental health information among respondents, followed by parents (19.3%), social media (9%), and health workers (7.5%).

Table 3. Dental care utilization and information sources among the respondents

Variables	Frequency (n)	Percentage (%)
Frequency of dental visits in the past 12 months		
Once	70	17.5
Twice	32	8.0
Three times	4	1.0
Four times	13	3.3
More than four times	21	5.3

Continue

Continuation		
No visit in past 12 months	131	32.8
Never received dental care/visited a dentist	88	22.0
Don't know/Don't remember	41	10.3
Reason for last visit to the dentist (n=140)		
Pain or trouble with teeth, gums or mouth	88	62.9
Treatment/follow-up treatment	25	17.9
Routine check-up of teeth/treatment	27	19.3
Sources of dental health information *		
Siblings	118	6.9
Friends	143	8.3
Parents	331	19.3
Teachers	387	22.5
Social media	154	9.0
Textbooks	360	21.0
Mass media	95	5.5
Health Workers	129	7.5

* Multiple responses

Mean DMFT and prevalence of dental caries

In Table 4, the prevalence of dental caries in the study participants is presented, with 63% (n=252) indicating "Yes" and 37% (n=148) indicating "No" out of the total 400 participants. The mean DMFT score, reflecting the severity of dental caries, was 1.67 (SD=1.83).

Table 4. Dental caries prevalence and severity in study participants: analysis of yes/no responses and mean DMFT Score

Variables	Frequency (n)	Percentage (%)
Dentition status (Mean, SD)		
Caries (D)	1.62(±1.79)	
Missing due to caries (M)	0.01(±0.11)	
Missing for any other reason (M)	0.01(0.13)	
Filled with caries (F)	0.01 (±0.11)	
Prevalence of dental caries		
Yes	252	63.0
No	148	37.0
Index		Mean ±SD
DMFT Index	1.67 (±1.82)	

Frequency and risk factors for dental caries among different variables

Table 5 presents the frequency and percentage distributions of dental caries according to different variables and the results of the Pearson chi-square test. Regarding age, it appears that those aged 10-12 have a higher percentage (71.3%, n=87) of dental caries compared to those aged 13-15 (59.5%) and 16-18 (58.8%). Males have a slightly higher percentage (64.2%, n=147) of dental caries compared to females (61.4%). Concerning ethnicity, others (75.8%) have the highest percentage of dental caries compared to Brahmin/Chhetri (64.8%) and Janajati (60.6%). Respondents with educated parents had slightly higher dental caries (66.7%), while daily wage workers (66.3%), respondents who brushed their teeth once a day (65.5%) and respondents whose teeth lacked fluoride (65.1%) had a higher prevalence of dental caries. However, there is no statistically significant relationship between dental caries and oral hygiene practices, including the frequency of teeth cleaning and the use of fluoride toothpaste.

Table 5. Association between dental caries and various factors among the respondents

Variables	Dental Caries		Chi-Square	P
	Yes	No		
	n (%)	n (%)		
Age				
10-14	172 (64.9)	93 (35.1)		
15-19	80 (59.3)	55 (40.7)	1.223	0.269
Sex				
Male	147(64.2)	82 (35.8)	0.327	0.568
Female	105 (61.4)	66 (38.6)		
Ethnicity				
Janajati	157(60.6)	102(39.4)		
Brahmin/Chhetri	70(64.8)	38(35.2)	3.087	0.214
Others	25 (75.8)	8(24.2)		
Religion				
Hindu	187(61.7)	116(38.3)		
Buddhism	45(65.2)	24(34.8)	1.213	0.545
Others	20(71.4)	8(28.6)		
Parent's education of the respondent				
Cannot read and write	7(58.3)	5(41.7)		
Informal Education	32(66.7)	16(33.3)		
Basic (grades 1-8)	80 (64.0)	45(36.0)		
Secondary (grades 9-12)	104(61.2)	66(38.8)	0.785*	0.950
University Education	29(64.4)	16 (35.6)		

Continue

Continuation				
Family Occupation of the respondent				
Farmer	33(60.0)	22 (40.0)	0.746	0.862
Business	82(63.6)	47 (36.4)		
Daily wage worker	57(66.3)	29(33.7)		
Professional	80(61.5)	50(38.5)		
Oral hygiene practices				
Frequency of tooth cleaning				
Once a day	150 (65.5)	79(34.5)		
Twice a day	91(59.9)	61(40.1)	1.467	0.480
2-6 times a week	11 (57.9)	8 (42.1)		
Use toothpaste that contains fluoride				
Yes	140 (62.2)	85(37.8)		
No	54 (65.1)	29(34.9)	0.210	0.901
Don't Know	58(63.0)	34(37.0)		

*Fisher's Exact Test

Discussion

To the best of our knowledge, this is the first study conducted among school children in Budhanilkantha Municipality. Our findings showed that 63% of the participants had dental caries, with a mean DMFT score of 1.67 (± 1.83). This result was comparable to previous studies^{9,13}, but higher than the findings reported by Suttagul et al.¹⁴, Ingle et al.¹⁵, and Shitie et al.⁶. However, a study conducted among male Saudi primary school children reported a prevalence of dental caries of 83%¹⁶, while a study conducted on primary schoolchildren in Yasuj Township, Iran reported dental caries in 75.3%, 41.1%, and 89.8% of children's primary, permanent, and whole dentitions, respectively^[5], and a study conducted in three schools in Turkey reported dental caries in 70.9% of participants¹.

In our study, all the participants reported brushing their teeth. This is similar to a cross-sectional survey conducted among Lahore school students, where only one respondent did not brush their teeth at all¹⁷. However, school-aged children in Niger State, Nigeria reported not brushing their teeth at all in 42.3% of cases¹³. A cross-sectional study carried out among Chepang females of Nepal reported that 85.6% brushed regularly and 76% brushed twice a day¹⁸. This result was comparatively higher than that of our study, which may be due to differences in the age range of participants and sample size. In both studies, however, these results were self-reported by the participants and were not verified during the study. A study carried out in five government primary schools in Chitwan's remote Chandibhanjyang Village Development Committee reported that 24% of children reported brushing their teeth twice daily, and 56% reported cleaning their teeth daily⁷, which is somewhat similar to our findings.

In our study, 100% of participants reported using a toothbrush, which is higher than in a previous study¹⁹. Our findings also showed that fruits, biscuits, cakes, cream cakes, and sweets/candy were the most commonly consumed foods, which is higher than in a study of preschool children in Abu Dhabi²⁰. We found that regular dental checkups were low (35%), and among those who had visited the dentist, the majority (62.9%) did so due to pain or trouble with their teeth, gums, or mouth. Similar results were reported in previous studies^{7,21}.

Our study found that the prevalence of dental caries was higher in children aged 10-12 (71.3%), which is similar to the finding of a study conducted in Chennai, India⁸. We also found that males had higher dental caries than females, but the difference was not statistically significant, which is similar to a previous study¹⁴. Additionally, we found that caries prevalence was not significantly associated with the frequency of brushing or type of toothpaste used, which is similar to a previous study²².

The study was conducted in only two schools located in Budhanikantha Municipality, Nepal, due to resource constraints and limited time for conducting the study. The selection of these schools was based on the permission granted by the school authorities and their willingness to participate, which may limit the generalizability of the findings to a broader population of school children. Furthermore, the convenience sampling method used in selecting the schools may introduce bias and restrict the representativeness of the sample. Moreover, data on food habits, oral hygiene practices, and health-seeking behavior were self-reported. This reliance on self-reporting may result in social desirability bias or recall bias, potentially affecting the accuracy and reliability of the obtained information.

In conclusion, the majority had dental caries, with slightly over one-third reporting brushing their teeth twice a day. Drinking tea with sugar, consuming sweets/candy, biscuits, cakes, and cream cakes were frequently reported dietary habits. Furthermore, the majority did not regularly visit the dentist for check-ups.

Based on our findings, we conclude that dental caries had a high prevalence in the study area, highlighting a significant oral health concern. Oral hygiene practices, dietary habits, and health-seeking behaviors were found to be unsatisfactory. We recommend that school authorities and parents encourage students to improve their oral hygiene, avoid consuming junk foods, and maintain regular dental visits. Additionally, we suggest incorporating oral hygiene topics into the school curriculum and organizing routine dental examinations at schools.

Interestingly, none of the factors showed a significant association with dental caries. This suggests the need to increase the sample size to enhance statistical power and improve generalizability. Conducting longitudinal studies can help explore the temporal relationship between dental caries, oral hygiene practices, and food habits. Furthermore, we recommend the inclusion of objective measures, such as biomarkers, to assess oral hygiene and dietary habits, reducing reliance on self-reporting alone.

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Conflicts of interest

There are no conflicts of interest.

Author Contribution

Rajesh Karki (Principal investigator): conceived the study design and procedure, performed data and statistical analysis, reviewed the manuscript, and participated in all stages of the study. **Kapila Lamichhane** and **Maheshor Kaphle**: supervised and participated in data collection, acquired permission from the concerned school, and prepared the first draft of the manuscript. All the authors reviewed the final manuscript and gave their approval.

Data availability

The data used in this study are available from the corresponding author upon reasonable request.

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