Original Research Article

Journal of Kathmandu Medical College, Vol. 12, No. 4, Issue 46, Oct.-Dec., 2023

Prevalence of dental caries and its association with sugar consumption and oral hygiene practices among children studying in government schools of Kathmandu, Nepal

Sundas S,[1] Dhakal N,[2] Rai A,[2] Joshi N[3]

[1]Sunanda Sundas, Professor; [2]Neha Dhakal, [2]Amita Rai, Assistant Professor, Department of Paediatric and Preventive Dentistry; [3]Neera Joshi, Professor, Department of Conservative and Endodontics, People's Dental College and Hospital, Sorhakhutte, Kathmandu, Nepal.

Abstract

Background: Dental caries is highly prevalent public health problem affecting quality of life, and adding economic burden to family and nation. Primary preventive measures are good oral hygiene, diet counselling, and regular fluoride use.

Objectives: To assess prevalence of dental caries and its association with sugar consumption and oral hygiene practices among school children.

Methods: An analytical cross-sectional study was conducted from 2021 September-December, among 279 children aged 6-14 years in five government schools of Kathmandu using convenience sampling. A self-validated questionnaire was used to record 24-hour diet chart and oral hygiene practices. Diagnosis of caries was done using decayed-missing-filled teeth (DMFT/dmft) index.

Results: Prevalence of dental caries among the participants was 82.44% (230). Mean dmft and DMFT were 2.65 ± 2.73 and 0.57 ± 0.91 respectively. Among all children, 228 (81.72%) consumed 'solid sugary' food in past 24 hours. There was no significant association between caries prevalence and form of sugary food consumed, but prevalence was higher among those who consumed sugary food more than once in past 24 hours. Similarly, there was no significant association between prevalence of caries and oral hygiene practices, but prevalence was lesser among children who brushed twice daily using fluoridated toothpaste. There was significant association between dental caries prevalence and mouth rinsing habit ($p = 0.037$).

Conclusion: Prevalence of dental caries among study population was high and majority consumed sugary food. Prevalence of dental caries was higher among children who consumed sugary food more frequently, and brushed and rinsed their mouth less frequently.

Key words: Children; Dental caries; Oral hygiene practices; Sugar consumption.

Access this article online

Website: www.jkmc.com.np

DOI: https://doi.org/10.3126/jkmc.v12i4.70911

HOW TO CITE

Sundas S, Dhakal N, Rai A, Joshi N. Prevalence of dental caries and its association with sugar consumption and oral hygiene practices among children studying in government schools of Kathmandu, Nepal. J Kathmandu Med Coll. 2023;12(4):228-33.

Submitted: Jul 30, 2023
Accepted: Nov 07, 2024
Published: Feb 27, 2024

Address for correspondence

Dr. Sunanda Sundas
Professor, Department of Paediatric and Preventive Dentistry
People's Dental College and Hospital, Sorakhutte , Kathmandu, Nepal
E-mail: tsunandasundas@gmail.com

INTRODUCTION

World Health Organisation (WHO) reports that 60-90% of school children worldwide present with dental caries. The prevalence of dental caries has been found to be more prevalent in developed and developing countries.[1] Prevalence of dental caries among Nepali children has been found to be 58% which is more than the prevalence of malnutrition (49%).[2,3] Consumption of sugar containing foods is believed to be on the rise in developing countries. Frequent consumption of sugary food and in the form that sticks to the teeth for longer duration pose increased risk for dental caries.[4]

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

Maintenance of good oral hygiene is a very important step towards the prevention of dental caries. Prevalence of dental caries has been found to be lesser among the children who brushed twice daily as compared to those who brushed less frequently.[5] Studies have shown that the fluoridated toothpastes are more effective in reducing dental caries as compared to the non-fluoridated toothpastes.[6,7] Thus, the objective of this study was to assess the prevalence of dental caries and its association with sugar consumption and oral hygiene practices among children of selected government schools of Kathmandu, Nepal.

METHODOLOGY

An analytical cross-sectional study was conducted among 279 children from five different government schools of Kathmandu, Nepal within a period of three months (2021 September 21 to 2021 December 20). Convenience sampling method was used to select the participants. Sample size was calculated by using the formula: $n = Z^2p(1-p)/d^2$ at the confidence interval of 95% with permissible error of 10%, which was based on the prevalence of dental caries (57.5%).[2] Ethical clearance was obtained from Institutional Review Committee of People's Dental College and Hospital (Ref. 37, CH NO 01, 2077/078) before commencement of the study. Health camps were organised in five government schools by Department of Paediatric and Preventive Dentistry and Department of Community Dentistry, People's Dental College and Hospital. Permission was taken from the Principals of the respective schools prior to conducting the health camps. Healthy children of age group 6-14 years were enrolled in the study. Children undergoing orthodontic treatment and children with special health care needs were excluded. Informed consent from parents and assent from children above seven years was taken before clinical examination.

A self-validated questionnaire was used to obtain demographic details and 24-hour recall diet history. Sugar exposure was considered as the number of times sugary food was consumed. To study oral hygiene habits, questionnaire included presence or absence of tooth brushing habit, frequency of tooth brushing, type of toothpaste used and mouth rinsing habit after food. Sugar containing diet was further categorised as 'solid sugary' which included 'solid and sticky' and 'slowly dissolving' sugary food and 'liquid sugary' diet.[8,9] Intraoral examination was performed by a single examiner using mouth mirror and WHO or Community Periodontal Index of Treatment Needs (CPITN) probe under natural day light. Caries experience was assessed using the decayed-missing-filled teeth (DMFT/dmft) index according to WHO criteria (Table 1).[10-14]

The recorded data were analysed using Statistical Package for Social Sciences version 16 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics included computation of frequency, percentages and mean. Chi-square test or Fischer's exact test were used wherever applicable. For all tests, confidence level and p-value were set at 95% and <0.05 respectively.

RESULTS

Among the total 279 children of study population, the prevalence of dental caries was seen in 82.4% (n = 230) and 131 (46.9%) children were male and 148 (53.1%) were female (Table 2).

Mean DMFT and dmft scores were higher among females in both primary and permanent dentition (Table 3).

The present study showed that 228 (81.7%) of the children consumed 'solid sugary' food in the last 24 hours (Table 4). Highest prevalence of dental caries was seen among the children who consumed 'solid sugary' food and among those children who consumed sugary food 1-3 times in the last 24 hours, but the difference in caries prevalence was not statistically significant (p >0.05).

The present study revealed that 268 (96.1%) of children brushed their teeth, and among these children 247 (92.2%) used fluoridated toothpaste (Table 5). Among the participating children, 197 children (83.5%) rinsed their mouth after food. There was statistically signification association between the prevalence of dental caries and mouth rinsing habit (p = 0.037). There was no statistically signification association between the prevalence of dental caries and brushing habit (Table 5).

Table 1: World Health Organisation criteria for the recording of decayed, missing, and filled teeth

Code	Description
Sound tooth	A crown was coded as sound if it showed no evidence of treated or untreated clinical caries. A crown with the following defects, in the absence of other positive criteria, was coded as sound: • white or chalky spots, • discoloured or rough spots that were not soft to touch with a metal CPITN probe, • stained enamel pits or fissures that did not have visible cavitation or softening of the floor or walls detectable with a CPITN probe, • dark, shiny, hard, pitted areas of enamel in a tooth showing signs of moderate to severe enamel fluorosis, • lesions that, on the basis of their distribution or history, or on examination, appear to be due to abrasion.
Decayed tooth	Caries was recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, had an unmistakable cavity, undermined enamel, or a detectably softened floor or wall. A tooth with a temporary filling, or one which is sealed but also decayed, was also included in this category. The CPITN probe was used to confirm visual evidence of caries on the tooth surface(s). Where any doubt existed, caries was recorded as absent. A filled tooth was considered as decayed tooth when it had one or more permanent restorations and one or more areas that were decayed.
Missing tooth	This code was used for permanent or primary teeth that had been extracted because of caries.
Filled tooth	A crown was considered filled, when one or more permanent restorations were present and there was no evidence of caries anywhere on the tooth. A tooth that had been crowned because of previous decay was also recorded in this category.

Table 2: Prevalence of dental caries

Sex	Total, n (%)	Caries present, n (%)	Caries absent, n (%)	p-value
Male	131 (100)	106 (80.9)	25 (19.1)	0.530
Female	148 (100)	124 (83.8)	24 (16.2)	
Total	**279 (100)**	**230 (82.4)**	**49 (17.6)**	

Table 3: dmft and DMFT scores

	dmft		DMFT	
Sex	**Mean ± Standard deviation**	**p-value**	**Mean ± Standard deviation**	**p-value**
Male	2.60 ± 2.48	0.809	0.56 ± 0.93	0.981
Female	2.68 ± 2.94		0.57 ± 0.89	
Total	**2.65 ± 2.73**		**0.565 ± 0.91**	

Table 4: Association of dental caries with form of food and number of sugar exposure

		Total n (%)	Dental caries		p-value
			Present n (%)	Absent n (%)	
Form of food	Non-sugary	23 (8.2)	17 (73.9)	6 (26.1)	0.357
	Solid sugary	228 (81.7)	188 (82.5)	40 (17.5)	
	Liquid sugary	28 (10.1)	25 (89.3)	3 (10.7)	
Sugar exposure	0	24 (100)	18 (75.0)	6 (25.0)	0.595
	1 - 3	250 (100)	208 (83.2)	42 (16.8)	
	>4	5 (100)	4 (80.0)	1 (20.0)	

Table 5: Association of dental caries and oral hygiene practices

Oral hygiene practices		Total n (%)	Dental caries		p-value
			Present n (%)	Absent n (%)	
Brushing habit	Yes	268 (96.1)	221 (82.5%)	47 (17.5%)	0.095
	No	11 (3.9)	9 (81.8)	2 (18.2%)	
Brushing frequency	Once a day	180 (67.2)	146 (81.2)	34 (18.9)	0.463
	Twice a day	86 (32.0)	75 (86.2)	12 (13.8)	
	Thrice a day	2 (0.7)	1 (50.0)	1 (50.0)	
Type of toothpaste	Fluoridated	247 (92.2)	204 (82.3)	44 (17.7)	0.990
	Non-fluoridated	21 (7.8)	18 (85.7)	3 (14.3)	
Rinsing habit	Yes	233 (83.5)	197 (84.5)	34 (15.5)	0.037
	No	46 (16.5)	33 (71.7)	13 (28.3)	

DISCUSSION

The present study revealed that the prevalence of dental caries among government school children of Kathmandu valley aged 6-14 years was 82.4% (n = 230), and dmft and DMFT scores were 2.65 ± 2.73 and 0.565 ± 0.91 respectively. The prevalence of dental caries was higher as compared to the study by Dixit et al., who had conducted the study among the children of age group 5-6 years (52%) and 12-13 years (41%) residing in a remote village of Chitwan, Nepal.[15] The caries prevalence and DMFT/dmft scores of the present study was also higher than the results shown by the study of Bhagat and Shrestha (dmft = 1.82; DMFT = 0.37) who had conducted the study among children of Eastern Nepal.[16] The increase in prevalence of dental caries in the current study may be due to change in lifestyle in urban area.

Dietary sugar is crucial causative agent for dental caries. The introduction of refined sugar (sucrose) into the modern diet has been associated with increased caries prevalence. The direct association of frequency of intake of sugary diet and the incidence of dental caries has been proven by Gustaffson et al. in the Vipeholm study (1954).[17] In the present study, 256 (91.8%) children had consumed sugary food in last 24 hours, out of which 228 (81.2%) was 'solid sugary' food. This could be the one of the attributing factors for increase in caries prevalence however, there was no significant difference in caries occurrence among children having different types of sugary food. More than three between-meal sugar-containing snacks or beverages per day is said to be one of the 'high-risk' factors for causation of dental caries. Sugary food consumption according to the diet history was categorised as no sugar exposure, 1-3 sugar exposure, and more than three sugar exposures in a day.[18] The current study showed that caries prevalence was higher among those children who consumed sugary food more frequently. This finding supports the fact that there is a direct relationship between the frequency of sugar consumption and dental caries as reported by Vishwanath and Sabu[19] and Sahoo et al.,[20] among Indian children, and Weisenbach et al.,[21] among French children.

The microorganisms responsible for causation of dental caries reside in dental plaque. Thus, maintenance of good oral hygiene plays important role in prevention of dental caries. Brushing teeth twice daily with fluoridated toothpaste is a recommended practice for maintenance of good oral health.[22] Yi-Chen et al., in their study reported that children who brushed their teeth after meals had significantly lower rate of dental caries and a reduced DMFT.[23] Ramesh and Sundari (2019) also reported that children who did not brush before going to bed at night had a 1.7 times higher prevalence of caries than children who brushed their teeth before going to bed at night.[24] In the present study, 268 (96.1%) of children brushed their teeth and out of which 180 (67.2%) of them brushed once daily and among them 247 (92.2%) used fluoridated toothpaste.

Better oral hygiene habits were found among the participants of the present study as compared to the study conducted by Dixit et al. among children residing in Chitwan, Nepal where only 56% children cleaned their teeth daily.[15] In the present study, dental caries prevalence was lesser among the children who brushed their teeth daily. Viswanath et al., and Pandit et al., also reported that children with tooth brushing practice had lower mean of DMFT and deft as compared to the children with no habit of tooth brushing.[5,19] Rinsing mouth with water after food is a common practice in Nepali culture. The study reported that 233 (83.5%) children rinsed their mouth with water. Among the children who rinsed their mouth, caries prevalence was significantly lower as

compared to the children who did not rinse their mouth after food. This finding is in accordance with report given by Dixit et al.,[15] which depicts that maintenance of good oral hygiene has a direct effect on dental caries.

The limitations of the study could be convenience sampling and single place study.

CONCLUSIONS

The prevalence of dental caries among the study population was high and majority of children consumed sugary food. Prevalence of dental caries was higher among the children who consumed sugary food more frequently, and brushed and rinsed their mouth less frequently. Thus, it is recommended that preventive programmes should focus in reducing the frequent consumption of sugary food and drinks, and at the same time, encourage brushing twice daily with fluoridated toothpaste, and rinsing mouth after every meal.

Conflict of interest: None.
Source(s) of support: None.

REFERENCES

1. Petersen PE. The World Oral Health Report 2003: Continuous improvement of oral health in the 21st century-the approach of the WHO Global Oral Health Programme. Geneva, Switzerland, 2003. [Full Text]
2. Yee R, Mishra P. Nepal national oral health pathfinder survey 2004. J Nepal Dent Assoc. 2005;7(1):64-8. [Full Text]
3. Sharma SK. Level and trend of children's health and nutrition status in Nepal. Evidence from demographic and health survey (NDHS). Government of Nepal. Singadurbar, 2016. [Full Text]
4. Ismail AI, Tanzer JM, Dingle JL. Current trends of sugar consumption in developing societies. Community Dent Oral Epidemiol. 1997;25(6):438-43. [PubMed | Full Text | DOI]
5. Pandit K, Kannan AT, Sarna A, et al. Prevalence of dental caries and associated teeth cleaning habits among children in four primary schools. Int J Epidemiol. 1986;15(4):581-3. [PubMed | Full Text | DOI]
6. Dummer PM, Oliver SJ, Hicks R, et al. Factors influencing the caries experience of a group of children at the ages of 11-12 and 15-16 years: Results from an ongoing epidemiological survey. J Dent. 1990;18(1):37-48. [PubMed | Full Text | DOI]
7. Levine RS. The scientific basis of dental health education. A health education council policy document. Br Dent J. 1985;158(6):223-6. [PubMed | Full Text | DOI]
8. Pillai GR, Abraham RA, George S, et al. Evaluating relationship between caries status and body mass in children and need for diet counselling: A cross-sectional study. J Oral Health Dent. 2020;3(2):201-7. [Full Text]
9. Khanapure S, Abraham A, Abokhlifa YH, et al. Prevalence of dental caries and treatment needs in Tibetan monks and nuns in Karnataka. J Pharm Bioallied Sci. 2020;12(Suppl 1):S214-7. [PubMed | Full Text | DOI]
10. Klien H, Palmer C. Studies on dental caries, familial resemblance in the caries experience of siblings. Public Health Rep.1938;53:1353-64. [Full Text]
11. Klein H, Palmer CE, Knutson JW. Dental status and dental needs of elementary school children. Public Health Rep.1938;53(19):751-65. [Full Text]
12. Gruebbel AO. A measurement of dental caries prevalence and treatment service for deciduous teeth. J Dent Res.1944;23(3):163-8. [Full Text]
13. World Health Organisation, Geneva. Oral Health Surveys Basic Methods. 5th ed. World Health Organisation; 2013:42-7. [Full Text]
14. Rai A, Sundas S, Dhakal N, et al. Assessment of dental caries based on ICDAS and WHO criteria: A comparative study. Int J Paediatr Dent. 2024;34(1):77-84. [PubMed | Full Text | DOI]
15. Dixit LP, Shakya A, Shrestha, M, et al. Dental caries prevalence, oral health knowledge, and practice among indigenous Chepang school children of Nepal. BMC Oral Health. 2013;13:20. [PubMed | Full Text | DOI]
16. Bhagat TK, Shrestha A. Prevalence of dental caries among public school children in eastern Nepal. J Chitwan Med Coll. 2014;4(1):30-2. [Full Text | DOI]
17. Gustafsson BE, Quensel CE, Lanke LS, et al. The Vipeholm dental caries study: The effect of different levels of carbohydrate intake on caries activity in 436 individuals observed for five years. Acta Odontol Scand. 1954;11(3-4):232-64. [PubMed | Full Text | DOI]
18. American Academy of Paediatric Dentistry. Caries-risk assessment and management for infants, children, and adolescents. The Reference Manual of Paediatric Dentistry. Chicago, Ill.: American Academy of Paediatric Dentistry; 2023:301-7. [Full Text]
19. Viswanath D, Sabu N. Prevalence of dental caries, the effect of sugar intake and tooth brushing practices in

children aged 5-11 years in Bangalore north. SRM J Res Dent Sci. 2014;5(3):155-62. [Full Text]

20. Sahoo PK, Tewari A, Chawla HS, et al. Interrelationship between sugar and dental caries - A study in child population of Orissa. J Indian Soc Pedod Prev Dent. 1992;10(1):37-44. [PubMed]
21. Weisenbach M, Chau N, Benamghar L, et al. Oral health in adolescents from a small French town. Community Dent Oral Epidemiol. 1995;23(3):147-54. [PubMed | Full Text | DOI]
22. Chester RK, Huntington E, Burchell CK, et al. Effect of oral care habits on caries in adolescents. Caries Res. 1992;26(4):299-304. [PubMed | Full Text | DOI]
23. Chen YC, Huang HK, Wu CH, et al. Correlation between dental caries and diet, oral hygiene habits, and other indicators among elementary school students in Xiulin Township, Hualien County, Taiwan. Tzu Chi Med J. 2014;26(4):175-81. [Full Text]
24. Ramesh S, Sundari S. Dental caries and oral hygiene practices among school children in Chennai, India: A cross sectional study. Int J Contemp Paediatr. 2019;6(5):2032-6. [Full Text]