

Burden of Dental Caries in the Nepalese Children: A Literature Review

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ABSTRACT

Dental caries is a biofilm mediated, sugar driven, multifactorial, dynamic disease that results in the phasic demineralization and remineralization of dental hard tissues. It is one of the most common global oral health problems that can occur throughout life, affecting both primary and permanent dentition. The only National Pathfinder survey of Nepal 2004 had shown 57.5% of 5-6 years age group and 25.6% of 12-16 years age group suffer from dental caries. Pain and discomfort due to untreated dental caries was 18% in 5-6-year-old. This review article draws attention to the current scenario of prevalence of dental caries in Nepalese children, which is needed to frame preventive strategies, policies and manpower allocations suitable for children. After identifying articles from PubMed, Google Scholar and hand searching, the prevalence of dental caries in Nepalese children is reviewed together.

Keywords: Dental caries, permanent dentition, primary dentition, Nepalese children.

INTRODUCTION

Dental caries is a chronic disease-causing localized destruction of hard tissues by acidic products from the bacterial fermentation of dietary carbohydrates that results from an ecological imbalance in the equilibrium between tooth minerals and oral biofilms.¹ According to the Global Burden of the oral disease dental caries is still a major health problem in most industrialized countries as it affects 60-90% of school-aged children and the vast majority of adults. In 2004, WHO updated the epidemiological information available in the data banks which showed the distribution and severity of dental caries varied in different parts of the world and within the same region or country.² There was an epidemiological survey done in Nepal in 1998 that reported the DMFT for 12 years old was 0.6 – 1.9 and emphasized on the need for national oral

health survey.³ The most comprehensive study carried out in Nepal was the National Pathfinder Survey carried out by Oral Health Focal Point and Ministry of Health funded by World Health Organization in 2004. It was reported that 58 % of 5 to 6-year-old schoolchildren suffered from dental caries.⁴

Dental caries, though preventable, is the most prevalent oral condition which can detrimentally affect different demographic groups, and can have huge public health impact on the oral and systemic health, social well-being, income of individuals and health care systems.⁵ In Nepal the prevalence of different dental disease are not explored and documented.⁶ According to the WHO recommendation, clinical oral health surveys should be conducted every 5-6 years to gather information on the oral health situation and services needed.⁷ Due to lack of general statistics about this issue in Nepalese population, this article aims to review the studies carried out in the country and analyze the results of these studies to compile a general statistic on the prevalence of dental caries in Nepalese population.

Using keywords “dental caries” and “Nepal”; PubMed and Google Scholar was searched for articles. As very few prevalence studies have been done in the Nepalese population, only the available studies in which dental

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caries prevalence data was available was included. Some articles from Nepalese journals that had prevalence data on dental caries but were not indexed by PubMed were also selected. Total 16 articles and 1 National Oral Health Survey was reviewed.

Yee et al.³ conducted a study in 2002 which was the only available study published where research was carried out before the National Pathfinder survey. It was a cross sectional study in the private and government school children of Central and Western Nepal where a total of 5500 children were examined and it was found that 5-6 years children had 67% caries prevalence with deft 3.3 and 12-13 years old presented with 41% of dental caries with mean caries index of 1.1.³

NATIONAL PATHFINDER SURVEY

Yee and Mishra⁴ conducted the National Pathfinder Survey where total of 4367 Nepalese was examined from 16 rural and urban sites from 5 developmental regions. Among the examined population, 1027 were 5-6 yrs old and 1074 were 12-13 years old, 1047 were 15-16 years old and remaining being the adults divided as 35-49 (n=603) and > 50 (n=616). The children were examined in the private and government schools. Prevalence of dental caries among 5-6 years old was 57.5% with mean dmfs 5.47 and mean dmft 2.70. The prevalence of dental caries was less in 12-13 years old children 25.6% (mean dmfs 0.74 and mean dmft 0.50). The sugar consumption and the dental caries rate was found to be higher in the western developmental region and less in the terai region. Fluorosis amongst younger children and adolescent was low.

OTHER STUDIES IN NEPALESE CHILDREN

Subedi et al.⁸ conducted a study in 638 school children to find the prevalence of dental caries. The children were divided into two groups: 5 - 6 years and 12 - 13 years using a stratified cluster sampling. Decayed, Missed and Filled teeth index and decayed, missed and filled surfaces index (dmft for primary dentition and DMFT for permanent dentition) were used as the standard tools for the determination of prevalence among 325 children of age group 12 - 13 years and 313 of age group 5 - 6 years from 30 different schools of the Kathmandu valley. The caries status was found higher in the age group of 5 - 6 years with prevalence 69% and mean dmfs 3.79 whereas

in the 12 - 13 years prevalence was 53.23% with mean DMFS 1.6. The dental caries status of the girls was found higher than that of the boys in both the age groups.⁸

Adhikari et al.⁹ examined 3174 school going children attending dental outpatient department. The study included children of age group of 5-14 years and assessment of dental caries was carried out using World Health Organization (1997) criteria. Prevalence of Dental caries in study population was found to be 47.1%. Caries prevalence in the age group 5-7, 8-10 and 11-14 years were 20.7%, 48.2% and 52.46% respectively. Mean Decayed, Missing and Filled teeth (DMFT) in the age group 5-7, 8-10 and 11-14 years were 1.96, 2.43 and 1.84 respectively. The treatment requirement in age groups of 5-7 years, 8-10 years and 11-14 years children were 87.2%, 85.3% and 71.4% respectively.⁹

Prasai et al.¹⁰ conducted a study on prevalence of dental caries in the Chepang children residing in the remote hilly region. After dental examination of 361 school children aged 5-16 year olds it was found that caries prevalence in 5-6 year olds was 52% and 12-13 year olds was 41%. The mean dmft/DMFT score of 5-6 year olds and 12 -13 year olds was 1.59, 0.31 and 0.52, 0.84 respectively. The D component was predominant in the dmft/DMFT index. Only 24% children reported having the habit of brushing the teeth twice daily.¹⁰

Khanal et al.^{11,12} reported that amongst 392 children aged 1-14 years who visited the dental out patient in the time period of 6 months, dental caries was present in 80.6 % of patients.¹¹ The same author had also evaluated the dental caries prevalence in 12-15 years old children. In 252 children the overall dental caries prevalence was 58.3% and the mean DMFT score was 1.2 (\pm 1.79) and the deft score was 0.6 (\pm 1.24). Children having good knowledge and practice had less dental caries.¹²

Shrestha et al.¹³ reported that in 366 children of 12-15 years old, from five schools within Jorpati Village Development Committee, Kathmandu, dental caries was diagnosed in 42.6% children, out of which 78.21% had caries in permanent teeth, 16.67% had caries in primary teeth, and 5.13% had caries in both dentitions. The age wise distribution of dental caries showed the highest prevalence among 12 year old students 23.8% and the lowest among 15 year olds 3.8%. Among the female students 43.5%

showed presence of dental caries, while the prevalence among male students was 41.8%. Restorative treatment (89.38%) was the main need in permanent dentition, and endodontic treatment (60.32%) in primary dentition.¹³

Bhagat et al.¹⁴ had assessed the prevalence of dental caries among 6 public school children of Eastern Nepal in Dhankuta and Sunsari district. A total of 666 school children were examined for prevalence of dental caries. DMFT score was evaluated for permanent teeth and dmft score for the primary dentition. The mean decayed and filled teeth were 1.82 whereas mean Decayed, Missing and Filled Teeth were 0.37. The prevalence of dental caries was 60.3% and 55.6% in the primary and permanent dentition respectively. The prevalence of dental caries was low in permanent dentition compared to primary dentition. Females showed higher score of DMFT and DMFS score than the males.¹⁴

Karki et al.¹⁵ assessed the prevalence of dental caries among 6-12 years old Tibetan children residing in Nepal. A cross-sectional study was conducted among 6-12 years old Tibetan children living in different Tibetan Refugee Settlements in Pokhara, Nepal. A total of 142 children were examined to record the dental caries status using deft index and DMFT index for deciduous dentition and permanent dentition respectively. The prevalence of dental caries was found to be 66.90% in deciduous dentition 29.57% in permanent dentition. The mean deft and DMFT was 2.32 and 0.66 respectively.¹⁵

Suttagulet al.¹⁶ assessed the prevalence of dental caries and oral health practice of school children of 4-15 years of Bhaktapur, Nepal. Three hundred and forty school children were examined for decayed, missing and filled teeth. Decayed, Missing and Filled Teeth (DMFT) in permanent teeth and decayed and filled teeth (dft) in primary teeth were calculated. In total study population, the mean DMFT index was 0.28 ± 0.37 whereas mean dft index was 1.21 ± 2.28 . In the children aged 4 to 9 prevalence of dental caries was 58.8% and 10 to 15 years it was 41.17% It was observed that dft index was higher in males compared to females and mean DMFT was higher in females.¹⁶

Khanal et al.¹⁷ had done a cross sectional study among two Government and two Private Primary School Children in Kathmandu district. Total sample were 468 children.

Among 468 primary school children of 5-15 years old The prevalence of dental caries was 62 % in primary teeth and 22.9% in permanent teeth. The decayed and filled teeth surfaces in Private and Government school was statistically significant ($p=0.000$) but gender wise comparison of decayed and filled teeth surfaces was found to be statistically insignificant ($p=0.303$).¹⁷

Limbu et al.¹⁸ conducted a cross sectional study on 17 preschools of Kathmandu following WHO criteria. In 1445 children aged 3- 6 years old, prevalence of dental caries was 55.6% (803) with a mean deft of 3.28 ± 3.581 and Significant Caries Index score was 7.439. Caries pattern showed the most commonly decayed teeth were mandibular second molars followed by maxillary central incisors. The least affected teeth were mandibular lateral incisors. The restorative care index was 106 (7.32%) in the total sample size and 14 (2.86%) in the SiC and disparity ratio was 2.26.¹⁸

Karki et al.⁷ evaluated the oral health of Nepalese school children, relative to their socio demographic characteristics. In this cross-sectional study 5–6, 12 and 15 year old Nepalese children were selected from 18 randomly selected districts of Nepal. The caries index was recorded using DMFT index (WHO criteria). The mean d-value for the 5–6-year-old children was 5.0 (4.22), which was higher than the mean D-values for the 12- and 15-year-old subjects, of 1.3 (1.77) and 1.9 (2.28), respectively. The youngest children, as well as children from the Kathmandu Valley, were likely to have more untreated caries lesions than children in the other age groups. The mean number of teeth with severe consequences of dental caries (pulpitis/ulceration/fistula/abscess or pufa/PUFA) was 1.3 (1.91) for the 5–6-year-old children; 0.1 (0.35) for the 12-year-old children and 0.3 (0.75) for the 15-year-old children.⁷

Bhagat et al.¹⁹ assessed the extent and severity of dental caries among 5-12 years old children of Eastern Nepal using DMFT (Decayed, Missing and Filled teeth) and SiC (Significant Caries) index. The study included 616 school children of 5-12 years old where decayed, missing and filled teeth were seen using WHO criteria. DMFT, dft (decayed filled teeth) and SiC Indices were calculated. The mean dft and SiC were 1.84 and 4.60 for primary dentition, whereas mean DMFT and SiC were 0.33 and 0.92 respectively for permanent teeth.¹⁹

Tsang et al.²⁰ assessed the prevalence of Early childhood caries in 6 months to 6 years old children in urban and rural areas. Total 836 children were examined caries was present in 58.2% children. There were 93.6% children with untreated dental caries. Children residing in the urban area presented with more caries compared with the rural children.²⁰

Bhagat et al.²¹ compared Body Mass Index and dental caries comprising 600 school children (mean age 9.36 ± 2.45) in eastern region of Nepal. Dental caries prevalence was found to be 57.3%. The difference in caries experience among gender was insignificant. Caries experience decreased significantly with increase in years of schooling and with increase in age). Caries experience increased with an increase in BMI but was not significant. There was a positive correlation between BMI and DMFT /DMFS but was not statistically significant. The correlation between dft and dfs was statistically significant.²¹

DISCUSSION

The present review on the prevalence and severity of caries in our country has implied that caries are a highly prevalent condition that has affected all ages in Nepal. Caries data on children at 12 years of age in the 1980s has revealed that the level of dental caries was low with the mean DMFT of 0.2 to 1.1.³ But the studies done in the past 20 years in Nepal has shown sudden rise in caries prevalence. This findings may be attributed to consumption of excessive sugar, malnutrition along with genetic predisposition and fluoride deficiency.²² There is also an evidence of transition of nutrition because of easy access to refined carbohydrates in both urban and rural areas of Nepal.²⁸ Despite greater health knowledge and resources among urban mothers, urban children's increased access to junk food and frequency of consumption was associated with higher prevalence and severity of caries compared to rural children.²⁰

According to Global Burden (2005) it was predicted that the incidence of dental caries would increase in future in many of the countries as a result of growing consumption of sugars and inadequate exposure to fluorides. Researches done on caries has demonstrated multifactorial relationship between plaque, sugar consumption, tooth susceptibility and time.¹⁵ It has been proven that controlling the frequency and amount of sugar consumption as well as fluoridation

of the teeth are more important preventive measures than mere mechanical plaque control. Oral hygiene also plays an important role in occurrence of dental caries. In a study done in Nepalese children oral hygiene practice was found to be good whereas in some other studies attitude and knowledge regarding oral hygiene was poor.^{12,24} Few studies have shown that despite having heavy plaque deposits, as long as daily sugar consumption was low, the children and adult of those study group were found to be caries free.^{25,26}

In most districts of Nepal including Kathmandu, the fluoride level in drinking water was found to be below the recommended optimum level whereas only one district had fluoride level exceeding 0.8 ppm (Parsa), and only 4% of the study population were exposed to the optimal level of fluoride in drinking water.^{7,27} It is a common practice that the parents decide and purchases the needful things for their children, thus children get what parents get for them. In a questionnaire KAP study conducted in Nepalese parents have shown that majority of the parents had low knowledge regarding the importance of using fluoridated toothpaste.²⁸ From the results of previous studies it can be extrapolated that because of contributing factors like poor oral hygiene, easy accessibility and excessive consumption of refined carbohydrates, low level of fluoride in the drinking water and deficiency of vitamin D, dental caries is still prevalent in the Nepalese children.

It was evident with this review that the dental caries in both primary and the permanent dentition was prevalent in the children of Nepal in different ages. Dental caries in the primary dentition is a major public health problem particularly in developing and underdeveloped countries.¹⁶ Many studies showed arch and site specific statistically significant caries prevalence with upper anteriors and lower posteriors.²⁹ Studies have reported that primary dentition appears to be more infected than the permanent teeth.^{3,8,10,15,16,17} The reason that the primary teeth presented with more caries may be attributed to their exfoliative nature because of which parents are more reluctant to seek dental treatment. Prasai et al had reported low dental visit with 93% of children having never visited a dentist or a health care service.¹⁰ Lack of utilization of dental services could be due to inadequate parental knowledge and awareness/prioritization for dental care, affordability issues and issues of child neglect.¹⁷

Table 1. Summary of the Prevalence of dental caries through various studies in Nepalese children.

S.N	Year	Author	Research design	Sample size	Age / Dentition	Location	Caries Prevalence	Caries Index
1	2002	Yee et al	Cross-sectional	5500	5-6 yrs 12- 13 yrs	Central, Western Nepal	5-6 yrs 67% 12-13yrs 41%	dmft/DMFT 5-6yrs: 3.3 12-13: 1.1
2	2011	Subedi et al	Cross-sectional	638	5-6yrs 12-13yrs	Kathmandu, Nepal	5-6yrs: 69% 12-13yrs: 53.23%	dmfs/DMFS 5-6yrs :3.79 12-13yrs: 1.6
3	2012	Adhikary et al	Cross-sectional	3174	5-14 years	Western Nepal	47.10%	DMFT 5-7yrs:1.96 8-10yrs:2.43 11-14yrs:1.84
4	2013	Prasai et al	Cross-sectional	131	5-16 years	Chitwan, Nepal	5-6yrs: 52% 12-13yrs: 41%	dmft/DMFT 5-6yrs :1.59/0.31 12-13yrs: 0.52/0.84
5	2013	Khanal et al	Cross-sectional	392	2-14 years	Kathmandu, Nepal	80.60%	
6	2014	Khanal et al	Cross-sectional	252	12-15 years	Kathmandu, Nepal	58.30%	def:0.6±1.24 DMFT:1.2±1.79
7	2014	Shrestha et al	Cross-sectional	366	12-15 years	Kathmandu, Nepal	42.60%	
8	2014	Bhagat et al	Cross-sectional	666	Primary and Permanent dentition	Eastern Nepal	60.30%	DMFT:0.37% DMFS:0.42%
9	2014	Bhagat et al	Cross-sectional	616	5-12 years	Eastern Nepal		dft:1.84 Sic:4.60 DMFT:0.33 Sic:0.92
10	2015	Karki et al	Cross-sectional	142	6-12 years	Pokhara, Nepal	Primary: 66.9% Permanent:29.57%	def: 2.32 DMFT:0.66
11	2016	Suttagul et al	Cross-sectional	340	4-15 years	Bhaktapur, Nepal	4-9 :58.82% 10-15 :41.17%	dmft :1.21±2.28 DMFT :0.28±0.37
12	2017	Khanal et al	Cross-sectional	468	5-15 years	Kathmandu, Nepal	Primary: 62% Permanent:22.9%	
13	2017	Limbu et al	Cross-sectional	1445	3-6 years	Kathmandu, Nepal	55.60%	Sic: 7.439
14	2018	Karki et al	Cross-sectional	4367	5-50+ years	Nepal (18 districts)	5-6 yrs:57.5% 12-13yrs: 25.6%	dmfs/dmft 5-6yrs:5.47/2.70 12-13yrs: 0.74/0.50
15	2019	Tsang et al	Cross-sectional	836	6months-6years	Kathmandu, Lalitpur, Sindhupalchowk	58.20%	
16	2020	Bhagat et al	Cross-sectional	600	9.36±2.45	Eastern Nepal	57.30%	DMFT/DMFS: 0.35±0.86/0.40±1.03 dft / dfs: 1.77±2.59/2.96±5.20

Untreated dental caries attributes to toothache which can impact daily activities in terms of play, sleep, eating and school activity.^{10,17} This will eventually lead to children missing their school resulting in their poor performances.¹¹ It is often responsible for the absenteeism from school, loss of working hours and has a considerable impact on oral health related quality of life which was seen by studies in our school children as well.^{7,13}

World Health Organization and World Dental Federation (FDI) established goals to achieve 50% of children aged 5-6 years to be caries free and global average of DMFT not to be >3 for 12-year-old children.⁵ But considering our population these goals are far from near. In different study groups that has been researched and reviewed, it can be concluded that the caries rate is very high in the Nepalese children, as the prevalence rate is above 50% in most of

the documented studies. To achieve the WHO goals of caries free children the dental professional and the parents have to focus more on preventive measures, parents and children education regarding oral health.

Out of the above mentioned articles reviewed most of the studies were conducted in Kathmandu (Central region of Nepal), few studies were carried out in Eastern Nepal whereas there were no studies available in the published literature that provided data on the population residing in remote hilly and Far Western region (Table 1). This implies a relatively substantial level of data is still absent regarding oral health. Poor oral health needs a substantial attention, as it leaves intense effect on general health and conditions as well. Therefore regular interval screening programs to assess the oral health of school children should be focused to provide the treatment as per the need.

CONCLUSION

A basic prioritized action plan using proven models and approaches must be used which will tangibly accelerate improvements in school oral health, targeting innumerable number of school children in Nepal. Hence to obtain nationwide representative data, nationwide multicentric study is required. More practicable alternative is to develop regional database; review of such observations from various regions which may give understanding of national scenario. There should be a general representative survey of at least all the districts in Nepal to comprehend the true prevalence of dental caries in children. The identification of the disease burden will help to judiciously utilize the limited resources available for oral and dental health.

Conflict of Interest: None

INAPD

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