

Assessment of Caries in Molar Teeth in Patients Visiting a Tertiary Care Hospital

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ABSTRACT

Introduction: Dental caries is the most common oral condition, causing direct impact on quality of life. Ascribed to poor access to oral health care services and inadequate exposure to fluoride, the prevalence of oral diseases is increasing in most developing countries.

Objective: To assess molar caries among different age groups, gender, and tooth types in patients visiting a tertiary centre.

Materials and Method: An analytical, cross-sectional study was conducted after ethical clearance at Department of Conservative Dentistry and Endodontics, College of Medical Sciences Teaching Hospital. Data from January 2018 to January 2020 were conveniently retrieved from 2437 dental records manually. The records were reviewed by three examiners separately to collect information on age, gender, tooth, and distribution of caries in maxilla and mandible. Patients with caries in permanent first and second molars were included. Records of patients with incomplete records or missing teeth were excluded. Data were entered in a data spreadsheet and subjected to statistical analysis using SPSS.v20.

Result: Out of 2437, molar caries was seen in 1185 (48.63%) patients. Prevalence of caries was found to be significantly higher (536, 45.23%) in early age group of 16-24 years. Mandibular arch demonstrated notably higher caries prevalence compared to maxillary arch and first molar had considerably more caries rate compared to second molar in all age groups.

Conclusion: Permanent first molar in early age group presented higher caries prevalence with more possibility of caries in mandibular arch. This finding can help in formulation of various preventive strategies.

Keywords: Age; dental caries; first molar; gender; second molar.

INTRODUCTION

The “Global Burden of Disease Study 2017” has estimated that oral disease is a widespread global health problem, with caries of permanent teeth being the most common condition that has a direct impact on the quality of life. Despite the overall decline in caries prevalence in developed countries, caries continues to be an important disease in most developing and industrialized countries.^{1,2} Ascribed

to poor access to oral health care services and inadequate exposure to fluoride, the prevalence of oral diseases is increasing in most low- and middle-income countries.³

Citation

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According to the Annual Report (2009/10), out of the total outpatient department (OPD) visits, 3.08% is related to oral health which shows a higher incidence of oral health problems in Nepal.⁴ Most epidemiological studies in Nepal have focused mainly on children rather than adults. There is one study conducted to determine prevalence and microbiological effect on dental caries.⁵ Another study was performed to determine the prevalence of tooth loss due to caries among adults.⁶ Currently, there is no data or literature on the prevalence of caries among adults of Chitwan, Nepal.

Thus, the aim of this study was to determine the prevalence of caries in permanent molars among different age groups in Chitwan Nepal.

MATERIALS AND METHOD

An analytical cross-sectional study was conducted among the patients visiting the Department of Conservative Dentistry and Endodontics of College of Medical Sciences Teaching Hospital after getting approval from the institutional review committee (Ref. COMSTH-IRC/2021-08). The data were retrospectively collected from January 2018 to January 2020 by retrieving from the dental records using convenience sampling technique. The study population consisted of four age groups, consisting of adults from 18-25 years of age, 26-35 years, 36-45 years, 46-55 years, and 56 years above of age. The inclusion criteria were: i) Patients visiting in Department of Conservative Dentistry and Endodontics of College of Medical Sciences, Teaching Hospital during January 2018 to January 2020 and ii) Patients with caries in permanent first and second molars. The exclusion criteria were: i) Subjects with incomplete records, (ii) Missing and extracted teeth, (iii) Patients with history of trauma or fractured tooth, and (iv) Caries present on anterior, premolars, and third molars.

The total number of patients visiting the dental OPD of the college of medical sciences teaching hospital from Jan 2018 to Jan 2020 was 7620. With this known population size, the sample size was

calculated using the formula:

$$n' = \frac{n}{\left(1 + \frac{z^2 X p(1-q)}{e^2 N}\right)}$$

where,

$$n = \frac{z^2 X p(1-q)}{e^2}$$

n' = sample size; $z = 1.96$; $p = 0.5$ (50%); $q = 1-p = 0.5$; $e = 0.05$ (5%); $N = 7620$

The total sample size was calculated to be 366. From the dental record, 2437 patients had visited the department of conservative dentistry and endodontic department during that time period. Among them, 1252 (51.37%) including those who did not fulfill the inclusion criteria were excluded. Similarly, 1185 (48.63%) patients who fulfilled the inclusion criteria and presented with caries in permanent first and second molars were included in the study.

The records were reviewed by three examiners separately to collect information on age, gender, tooth, and distribution of caries in maxilla and mandible.

With the consensus of examiners, the principal researcher collected data from the record of the department of conservative dentistry and endodontics manually which was entered in a data spreadsheet and subjected to statistical analysis using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). The various categorical variables were described using frequency and percentage and Pearson's Chi-square test were used for statistical analysis and P value <0.05 was considered significant.

RESULT

A total of 2437 subjects were evaluated from dental records of the dental department of CMS-TH out of which 1185 presented with caries on the permanent first and second molar tooth. Among the subjects with caries, 492 (41.52%) were females and 693

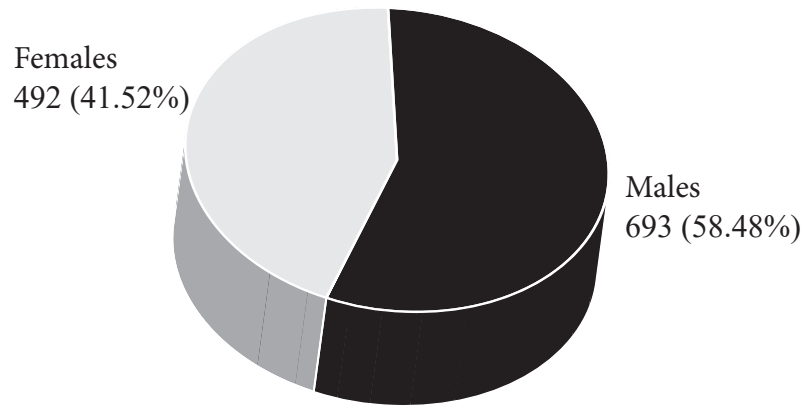


Figure 1: Distribution of included studies according to gender.

(58.48%) were males (Figure 1). The difference between males and females with caries in the permanent first and second molar was statistically nonsignificant.

The 16-25 years age group had maximum caries (536, 45.23%) followed by the age group of 26-35 (249, 21.01%). The age group of 56- and above reported the least caries prevalence (105, 8.86%). Caries prevalence in the young age group was found to be significantly higher and decreased with an increase in the age group (Table 1).

In 1185 individuals included in the study, 2616 teeth presented with carious lesions. All the age groups

reported a considerably higher percentage of caries in the mandibular arch compared to the maxillary arch (Table 2). The distribution of carious teeth was found to be higher in the mandibular arch with mandibular first molars having the highest caries prevalence. However, maxillary second molars had the least prevalence of caries.

Occurrence of caries in the mandible was found to be notably higher ($P < 0.05$) in every age group compared to maxilla (Table 3). Similarly, in all age groups prevalence of caries in the first molars were significantly higher ($P < 0.05$) than second molar (Table 4).

Table 1: Distribution of population according to gender and age groups, n (%).

Age in years	Male	Female	Total
16-25	308 (44.40)	228 (46.30)	536 (45.23)
26-35	155 (22.40)	94 (19.10)	249 (21.01)
36-45	117 (16.90)	57 (11.60)	174 (14.70)
46-55	67 (9.70)	54 (11.00)	121 (10.20)
≥56	46 (6.60)	59 (12.00)	105 (8.86)
Total	693 (100)	492 (100)	1185 (100)

P value = 0.002. Chi-square test.

Table 2: Distribution of included carious teeth according to the jaw, n (%).

Tooth	Mandible	Maxilla	Total
Right first molar	474 (18.12)	295 (11.28)	769 (29.40)
Right second molar	377 (14.41)	172 (6.58)	549 (20.99)
Left first molar	486 (18.58)	263 (10.05)	749 (28.63)
Left second molar	382 (14.60)	167 (6.38)	549 (20.98)
Total	1719 (65.71)	897 (34.29)	2616 (100)

Table 3: Interarch relation of caries according to age groups.

Age group (years)			Mandibular molars			Pearson Chi-square value	P value
			Without caries	With caries	Total		
16-25	Maxillary molar	Without caries	-	268	268	91.284	<0.001
		With caries	78	190	268		
	Total	78	458	536			
26-35	Maxillary molar	Without caries	-	144	144	77.381	<0.001
		With caries	46	59	105		
	Total	46	203	249			
36-45	Maxillary molar	Without caries	-	86	86	57.554	<0.001
		With caries	44	44	88		
	Total	44	130	174			
46-55	Maxillary molar	Without caries	-	44	44	47.056	<0.001
		With caries	49	28	77		
	Total	49	72	121			
56-...	Maxillary molar	Without caries	-	49	49	61.250	<0.001
		With caries	42	14	56		
	Total	42	63	105			
Total	Maxillary molar	Without caries	-	591	591	329.768	<0.001
		With caries	259	335	594		
	Total	259	926	1185			

Table 4: Relation of first and second molar caries according to age group.

Age group (years)			Second molar			Pearson Chi-square value	P value
			Without caries	With caries	Total		
16-25	First molar	Without caries	-	63	63	56.161	<0.001
		With caries	236	237	473		
	Total	236	300	536			
26-35	First molar	Without caries	-	46	46	50.012	<0.001
		With caries	117	86	203		
	Total	117	132	249			
36-45	First molar	Without caries	-	41	41	42.579	<0.001
		With caries	77	56	133		
	Total	77	97	174			
46-55	First molar	Without caries	-	48	48	48.798	<0.001
		With caries	46	27	73		
	Total	46	75	121			
56-...	First molar	Without caries	-	35	35	47.727	<0.001
		With caries	50	20	70		
	Total	50	55	105			
Total	First molar	Without caries	-	233	233	231.493	<0.001
		With caries	526	426	952		
	Total	526	659	1185			

DISCUSSION

Dental caries is the widely prevalent disease problem globally. According to a recent survey by Global Oral Health Data Bank, the prevalence of dental caries varies in the range of 49% to 83%. Dental caries is found to be prevalent in almost all age groups. Various studies have shown that adolescents aged 12-19 years had the highest number of dental caries followed by children and adults.⁷ Poor oral hygiene and sugar intakes are the most common factors for the initiation of dental caries. Tooth anatomy and morphology have been shown as the predisposing factors for dental caries to facilitate its initiation.

The epidemiological study of dental caries provides knowledge on the current status of oral health of the individual that aids to develop a proper treatment plan according to severity of disease. For present retrospective study, patient treatment records were used to collect the data. However, current method may be less expensive but various aspects like dietary habits, oral hygiene practice might have been missed out.

Permanent molars were selected in this study because of its importance on mastication, orthodontic anchorage, and maintaining the vertical dimension of the face. Permanent first molars are the first to erupt in the oral cavity at an early age. It maintains the space for the eruption of the tooth mesial and distal to it. Moreover, it is considered as the biggest tooth for provision of more surface area required for the desired occlusion and occupies the strategic position in the dental arch. Because of the maximum root surface area, permanent first molars are utilized as anchorage. They also maintain the occlusal height and aesthetic proportions of the jaw.

The high risk of caries in permanent molars may be due to its morphological characteristics, time of eruption, and position in the oral cavity. Maintenance of proper oral hygiene around it is quite difficult, especially on the interproximal area. Therefore, there is a high probability of food lodgment, formation of plaque that favours microbes growth resulting in tooth decay. Furthermore, the most common site of dental caries in those teeth like pits and fissures of the crown, beneath the contact

areas of proximal surfaces, and the cervical third of crown between the gingival margins and the point of maximum convexity of the crown, present difficulty to clean. At such areas bacteria in form of dental plaque adhere to the teeth and are relatively protected from being scrapped off.⁸

In the study, it was observed that carious lesions were more in male (58.28%) as compared to females (41.52%) which is in contrast to a study done by Yadav (2015), Kamberi (2016), Demirci (2010), Maru (2012), Baranwal (2015), Sudhakaran (2016), Gupta (2020), Baranwal et al.^{5,8-13}

The study populations were divided into four different age groups. This study showed an increase in the incidence of caries in age groups of 16-25 years old (45.23%). Similarly, study reported a decrease in caries prevalence with an increase in age which is similar to the finding of Kamberi (2016), Demirci (2010), Gupta (2020).⁸⁻¹⁰ A higher prevalence of caries was found in the early age group which may be due to poor oral hygiene and morphological features of the molar. Likelihood of a higher rate of caries at an early age may be because of early eruption of these teeth. They are seen to present a higher rate of caries in the first three years of eruption. Likewise, presence of operculum also favours the formation of plaque, and lack of proper cleaning around these regions as well as deep pits and fissures and grooves facilitate the food lodgment in these sites. In due course because of continuous masticatory functions of the molar, they get attrited resulting in loss of deep pits and grooves with flat occlusal surfaces which favours cleaning of the area. Complete eruption of permanent molars at a later age reduces plaque and food accumulation in that area. Caries prevalence in the early age group was supported by Yadav (2015), Gupta (2020), Kamberi (2016), Maru (2012).^{5,8,9,11}

The first permanent molar is the first permanent tooth to erupt in the oral cavity meaning they are present for a longer duration in mouth. Mostly, parents are unaware of the permanent first molars which they get mistaken with the primary tooth. Instead of preserving the tooth, they get to neglect the importance of the tooth with misconception that

it might get replaced with other tooth or permanent tooth in the future.

The findings of the present study revealed that mandibular posteriors were more affected by caries compared to maxillary posteriors which is similar to study done by Upadhaya (2009), Sudhakaran (2016), and Uttarwar (2017).^{6,13,14} However, other studies performed by Yadav (2015), Demicri (2010), and Gupta (2020) found that maxillary posteriors are more susceptible to dental caries.^{5,8,10}

Permanent first molars were the most affected teeth compared to permanent second molars which is similar to findings of a study performed by Nazir (2019), Gupta (2020).^{8,15} This could be due to the morphology of molar teeth with deep pits and fissures, large-sized crown making them more retentive to food and plaque leading to carious attack by bacteria. Early eruption of the tooth could be also a possible reason.¹⁶ Morphological characteristics of permanent first molar make it more vulnerable for caries. Accumulation and retention of bacterial plaque in the first permanent molar may be due to its complicated pits and fissures and the operculum covering the distal half of the first permanent molars.¹⁷

However, other studies show the contrast result with more caries in the maxillary quadrant and second molars compared to the mandibular quadrant and first molars.^{5,10,18} The distal position of second molars compared to first molars in the dental arch may offer less accessibility for cleaning than that for first molars. However, in this study, mandibular first molars were highly affected tooth with caries and the maxillary second permanent molar was the least affected tooth, which is similar to another study.¹⁴

The differences in the involvement of molars may also be due to genetic variation, malnutrition during the mineralisation of second molars, differences in

the fissure systems, and degree of post-eruptive maturation. In same way, the difference in caries susceptibility and progression of lesions can be due to chemical and structural differences of enamel between contacting surfaces. Several studies presume that the early eruption of tooth may be a disadvantageous as they become more susceptible to caries. The post-eruptive maturation of enamel fails to prevent caries in proximal surfaces. During tooth eruption, the proximal surfaces between the fully erupted adjacent tooth and erupting tooth, become a retentive area of plaque accumulation during the self-cleansing process. This leads to the establishment of caries-producing plaque and formation of caries in approximal areas.⁸

The limitations of this study were that these results cannot be generalised to the whole population of the area. Secondly, other factors such as dietary habits, oral hygiene practices, socio-economic status, and cultural practices were not taken into account. However, the results of this study can provide baseline data for the planning and execution of various preventive programs that will assist in controlling the disease burden.

CONCLUSION

This study will assist to comprehend the importance of further research on the prevalence of caries and aid in planning the preventive measures. Status of these teeth in the current study provide the analysis of oral health status of the population examined. So, it is imperative to know the caries prevalence in first and second molars and adequate measures must be taken to prevent its progression or development of new carious lesions.

Conflict of interest: None.



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