

Prevalence of type of dental caries among the patients visiting a tertiary health care center in the Western region of Nepal

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ABSTRACT

Introduction: Dental caries is one of the major public health problems globally due to its high prevalence and significant social impact. The objective of the present study was to assess the most prevalent type of dental caries among the studied population. **Methods:** This cross-sectional study was conducted among 300 participants. The data were collected by intra-oral examination of the subjects, where the type of dental caries in each patient was examined. The surfaces infected with dental caries were recorded as occlusal pit and fissure caries, root caries, smooth surface caries, and recurrent caries. Descriptive statistical methods were applied for data analysis. **Results:** The most prevalent type of dental caries was found to be the occlusal pit and fissure caries 595(66.04%) followed by smooth surface caries 220(24.42%), recurrent caries 54(5.99%) and root caries 32(3.55%). The occlusal pit and fissure caries was more prevalent in the mandibular arch 298(67.73%). Males had more prevalence of different types of dental caries. Based on the age group, 40 to 50 years age group had the most prevalent type of occlusal pit and fissure caries 60(20%). **Conclusions:** The results showed a high prevalence of occlusal pit and fissure caries in the study population followed by smooth surface caries, recurrent caries, and root caries.

Keywords: Occlusal pit and fissure caries, recurrent caries, root caries, smooth surface caries.

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INTRODUCTION

Dental caries is a multifactorial, transmissible, infectious oral disease caused primarily by the complex interaction of cariogenic oral flora with fermentable dietary carbohydrates on the tooth surface over time.¹ It is a major public health problem globally due to its high prevalence and significant social impact.² The information regarding a patient's caries pattern or the site of caries location may provide knowledge regarding the etiology of the disease.³ According to the location of dental caries,¹ it is classified into occlusal pit and fissure caries, smooth surface caries, root caries, and recurrent caries.

The prevalence pattern of dental caries varies with age, socioeconomic status, race, food, and oral hygiene habits.⁴ There are very few studies worldwide assessing the type of dental caries among the adult population.⁵⁻⁷ However, in the context of Nepal, most studies regarding the prevalence of caries have been conducted among only children and adolescents.⁸⁻¹³ A comprehensive insight into prevalence rates of dental caries among the adult population based on the type of dental caries has remained unexplored.

Preventive and oral health programs should be planned, targeted, and implemented for those at the greatest risk of dental caries.¹⁴ Therefore, this study was conducted with the aim to assess the prevalence of type of dental caries among patients visiting a tertiary

health care center in the Western region of Nepal. These data can help to plan preventive strategies for the population at greater risk for the development of dental caries.

METHODS

In this cross-sectional study, a total of 300 patients reporting to the Department of Conservative Dentistry and Endodontics, Gandaki Medical College Teaching Hospital & Research Centre Pvt. Ltd., Pokhara were examined. The samples were selected by convenient sampling method. Ethical approval for the study was obtained from the Gandaki Medical College Institutional Review Committee. (Ref. No. 12/080/081-F) The study was conducted from October 2023 to January 2024.

To determine sample size, the formula $n = z^2pq/d^2$ was used with prevalence ($p = 80.76\%$) taken from a previous study.⁵ The calculated sample size of approximately 300 was taken at 95% confidence and 5% precision. The patients with age of ≥ 18 years and those willing to participate were included in the study. Written informed consent was obtained from the research participants.

The data were collected by a single examiner (principal author) and recorded in a pre-designed subject proforma that comprised two parts: the first part included demographic details (age, sex) while the second part included intra-oral clinical examination. The study population was categorized into groups of 18 to 28 years, 29 to 39 years, 40 to 50 years, 51 to 61 years, 62 to 72 years, and >72 years of age. On intraoral examination, the type of dental caries in the patients was examined under the dental unit light in the oral cavity with a diagnostic dental probe and mouth mirror. The examination of patients involved the sequential assessment of each permanent tooth surface. All exposed and accessible surfaces were examined for dental caries using the WHO diagnostic criteria.¹⁵ Firstly, carious teeth were identified, and a diagnosis of caries was made only when there was a clear evidence of loss of tooth substance. The site infected with dental caries was recorded as occlusal pit and fissure caries, root caries, smooth surface caries, and recurrent caries¹. The obtained data were entered into a Microsoft Excel sheet and statistical analysis was done using statistical package for social sciences (SPSS version 16.0) to derive the conclusive results.

RESULTS

The study population consisted total of 300 samples with an age group ≥ 18 years where 158(52.67%) were males. About a total of 901 surfaces were recorded with different types of caries, where 461 surfaces in the maxillary arch exhibited caries while 440 surfaces in mandible. About

595(66.04%) of the total population had occlusal pit and fissure caries, followed by smooth surface caries 220(24.42%), and root caries 32(3.55%) had the least prevalence. (Table 1)

Table 1: Prevalence of different types of dental caries in the study population

Types of dental caries	Frequency(n)	Percentage(%)
Occlusal pit and fissure caries	595	66.04%
Root caries	32	3.55%
Smooth surface caries	220	24.42%
Recurrent caries	54	5.99%
Total surfaces involved	901	100%

Based on the arch distribution, occlusal pit and fissure caries was found to be more prevalent in the mandibular arch 298(67.73%) than in maxilla 297(64.43%) as shown in Table 2.

Table 2: Prevalence of different types of dental caries based on the archwise distribution

Types of dental caries	Maxillary arch n(%)	Mandibular arch n(%)
Occlusal pit and fissure caries	297(64.43%)	298(67.73%)
Root caries	18(3.90%)	14(3.18%)
Smooth surface caries	124(26.90%)	96(21.82%)
Recurrent caries	22(4.77%)	32(7.27%)
Total surfaces involved	461	440

Table 3 shows the comparison of different age groups with the types of dental caries. The occlusal pit and fissure caries was most prevalent in 40 to 50 years age group 60(20%), whereas the root caries was more prevalent in the 51 to 61 years age group 7(2.33%), smooth surface caries in 40 to 50 years age group 31(10.33%) and recurrent caries in the 40 to 50 years age group 10(3.33%).

Table 3: Prevalence of different types of dental caries based on the age group-wise distribution

Type of dental caries	18-28 years n(%)	29-39 years n(%)	40-50 years n(%)	51-61 years n(%)	62-72 years n(%)	>72 years n(%)
Occlusal pit and fissure caries	57 (19%)	39 (13%)	60 (20%)	50 (16.67%)	34 (11.33%)	4 (1.33%)
Root caries	1 (0.33%)	3 (1%)	6 (2%)	7 (2.33%)	4 (1.33%)	1 (0.33%)
Smooth surface caries	28 (9.33%)	12(4%)	31 (10.33%)	26(8.67%)	17 (5.67%)	5 (1.67%)
Recurrent caries	4 (1.33%)	2 (0.67%)	10 (3.33%)	8 (2.67%)	7 (2.33%)	0 (0%)

Table 4 shows the comparison of different types of dental caries among different sexes where males had more prevalence of all types of dental caries than females.

Table 4: Prevalence of different types of dental caries based on the sex distribution

Type of dental caries	Male n(%)	Female n(%)
Occlusal pit and fissure caries	124(41.33%)	120(40%)
Root caries	13(4.33%)	9(3%)
Smooth surface caries	60(20%)	59(19.67%)
Recurrent caries	16(5.33%)	15(5%)

DISCUSSION

Dental caries is a localized destruction of hard tissues resulting in an imbalance in the equilibrium between tooth minerals and oral biofilms. The location of dental caries provide a useful descriptive measure of caries susceptibility in different tooth surfaces of an individual. Determining the most prevalent site of dental caries can help to motivate the patients for effective cleaning of the susceptible areas. The present study showed that occlusal pit and fissure caries was the most prevalent type of dental caries which was found to be similar to the results reported in the previous studies.^{7,16,17} This could be due to the complicated surface morphology of occlusal pit and fissures which make these retentive to food and eventually makes it difficult to clean. Overall, a combination of anatomic features, poor oral hygiene practices, dietary habits and lack of preventive measures contribute to the high prevalence of occlusal pit and fissure caries. However, in a study by Demirci et al.⁶ they reported high prevalence of interproximal caries ranging from 58.5% to 77.5% in the other teeth except for molars while occlusal pit and fissure caries was prevalent most significantly on the first and second molars ranging from 52.7% to 66.3%. Furthermore, root caries was found to be least prevalent in the present study while the study by Khan et al.⁵ reported recurrent caries as the least prevalent type. Various tooth surface morphologies and even the difference in the post-eruptive enamel maturation of the surfaces are also the reasons for the different caries susceptibilities.¹⁸ The pattern of dental caries is also a useful source for the prevention of caries. The complicated surface morphology and difficult access for effective oral hygiene have been reported for the development of occlusal pit and fissure caries.⁶ The architecture sites of these types of dental caries are retentive to carry food substances and are not fully exposed to the flushing action of saliva. This results in the formation of biofilm in these areas which are protected from mechanical wear by tongue, cheeks, abrasive food, and tooth brushing.¹⁹

The smooth surface caries which are said to be present in proximal surfaces and gingival areas of the buccal and lingual aspect of teeth, were found to be the second most prevalent type of dental caries in the present study. It

has been reported that there is a difference in the caries susceptibility in adjacent proximal tooth surfaces as one surface may show distinct radiographic signs of caries, while the neighboring surface may not.²⁰ The smooth surface caries are generally correlated with long-term poor oral hygiene and long-term accumulation of plaque, which is a very common practice in rural areas due to a lack of awareness regarding dental hygiene.²¹ The study by Kutesa et al.⁷ reported the high occurrence of interproximal caries in the incisors which implied that preventive procedures like regular flossing were lacking in the study population.

Recurrent caries or secondary caries which are the caries occurring at the junction of a restoration and tooth which usually progresses under the restoration was the third most prevalent type of dental caries in the present study. Similar to the present study, Nedeljkovic et al.²² reported recurrent caries more in mandibular arch than the maxillary arch. In the present study the males had more recurrent caries than females, however in contrast to this result studies,^{5,22} have reported females with more recurrent caries. Recurrent caries which is considered as one of the major cause for failure of dental restorations has been reported to be prevalent significantly higher with composites, class II restorations, high-caries-risk patients, smokers and in the gingival margin of restoration.²² Therefore, higher attention should be given to these predisposing factors during the assessment of dental caries and restoration.

Root caries which are identified as caries in the root surface, particularly in the cemento-enamel junction (CEJ), were the least prevalent type of dental caries in the present study and have been usually associated with poor health of the gingival area.²³ In the study by Khan et al.⁵ a high occurrence of root caries among males including tobacco chewers was found, which usually results in unhealthy gingiva, and it might have resulted in dental caries in these areas. Furthermore, a study by Kumara-Raja et al.²⁴ has reported a high prevalence of root caries in older age group populations which was in agreement with the present study, where root caries was most prevalent in the 50 to 60-year-old population when compared among other age-groups.

The most prevalent type of caries in the present study, i.e, the occlusal pit and fissure caries were found to be more prevalent in the mandibular arch. This finding was similar to the study by Demirci et al.⁶ where they demonstrated high caries frequency in the occlusal fissures of first and second mandibular molar teeth when compared with the occlusal fissures on the first and second maxillary molars. Permanent mandibular first molars are the first permanent teeth to erupt in the oral cavity followed by permanent

maxillary first molars. Therefore, as being the first permanent teeth to erupt, they have the most susceptibility to caries attack especially in the occlusal pit and fissure areas.

Furthermore, in the present study, smooth surface caries showed higher prevalence in the maxilla than in mandible which was similar to the studies by Demirci et al.⁶ and Dikshit et al.¹³ This could be attributed to the complex anatomy and topography of the maxillary teeth. This morphological complexes hinder the effective oral hygiene maintenance thereby, increasing the likelihood of plaque buildup and subsequent caries development. In addition to this, an individual might give more effort while brushing their mandibular teeth compared to their maxillary teeth. Furthermore, the cleaning is comparatively compromised in the maxillary posteriors due to hindrances by muscular attachment and coronoid process of mandible.

Different age groups and populations exhibit distinct caries prevalence rates. Older adults have considerably more factors that place tooth surfaces at risk for caries than younger adults. Various health issues faced by the old aged population during the later phases of life can last as long as 40 years,²⁵ could have been the reason for the most affected age group 40 to 50 years with occlusal pit and fissure caries in the present study. In the present study, when comparing among the different age-groups, the occlusal pit and fissure caries was more common in almost all age groups than the smooth surface caries.

However, the age group 18 to 28 years in the present study had relatively higher occlusal pit and fissure caries after the 40 to 50 years age group which was similar to other studies.⁵⁻⁷ where the young adult group had high caries prevalence rate. Young adults' tendency to eat cheap food and unpredictable dietary habits could have also been the reason for their high caries susceptibility.²⁶ The occlusal fissures are invaded by dental caries most frequently in the younger age group, while in the older age groups, occlusal lesions are relatively uncommon, possibly because occlusal attrition progressed more rapidly than caries.²⁷ In the study by Demirci et al.⁶ where occlusal pit and fissure caries in the 17 to 25 years age group had a high caries rate, it was observed that a greater number of caries are experienced in younger age groups, and this rate decreased with age as the decrease in caries along with age may not result from reduced caries activity but from the reduced number of remaining teeth.²⁸ The caries activity continues throughout life and is not confined to any period of life, although the incidence decreases with an increase in age.⁷ This could have been the reason why in the older age group i.e. >72 years old age, the smooth surface caries was greater

than occlusal pit and fissure caries. This result was also in agreement with the study by Hopcraft et al.¹⁷ where they reported an increasing prevalence of interproximal caries of posterior teeth in the older population. The interproximal caries which usually occur more commonly at the cervical margins than at the contact areas may also be due to attrition. This attrition of the teeth leads to continuous eruption of teeth and exposure of the cervical areas of teeth in the interproximal area.²⁷ With increasing attrition, the contact points are also destroyed and this will allow an increase in food lodgement in the cervical areas. Furthermore, Kutesa et al.⁷ in their study also reported that assuming the rate of progression of caries takes 3 to 4 years before it gets to pulpitis, which is the trigger for seeking services and considering 20 to 29 years age as the most affected, the initial attack probably occurred in their teens. It is therefore beneficial to target young teens with caries preventive programs.

In the present study, males had a higher prevalence rate in all types of caries which was similar to the studies done by Adhikari et al.⁹ and Olabisi et al.²⁹ This could be attributed to better oral health care-seeking behavior exhibited by women. The lack of everyday brushing and negligence in oral hygiene maintenance could have been the reason explaining the high male caries prevalence in the present study. Moreover, the difference in sex distribution in the present study, where the number of males was greater than the females could have also been the reason supporting the result with overall higher male caries prevalence than females. However, in contrast to the present study, there are different studies,⁵⁻⁷ which have reported female predominance. The reason behind this could be the earlier eruptions of permanent teeth in females which makes the longer duration of caries exposure in oral cavity.³⁰

The present study provides an outline of prevalence of different types of dental caries and its association with various pertinent demographic factors. It is imperative to analyze the factors like arch distribution, sex, and age with the various types of dental caries. This, in turn, can help to plan, target and implement the various preventive strategies for the population at greater risk for the development of dental caries. This study bears some limitations. The chronology of caries development were not determined in the study. A more detailed collaborative, multicentric and longitudinal studies with larger sample size, incorporation of radiographic examination along with the use of advanced diagnostic techniques could have aided to generalize the results of this study.

CONCLUSIONS

The occlusal pit and fissure caries was found to be the most prevalent type of dental caries in the study population. Males had a higher caries prevalence in all different types of dental caries. Moreover, the occlusal pit and fissure caries which was found to be the most prevalent type of dental caries was found highest in the 40 to 50 years age group study population with higher prevalence in the mandibular arch. This study outlines the most prevalent types of dental caries based on location. The results of this study could be utilized for various preventive and oral health awareness programs emphasizing oral hygiene practices, diet modification, and regular dental visits to manage the existing carious lesions while preventing the early carious lesions in other areas.

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AUTHORS' CONTRIBUTION

BP designed the research, collected data, performed statistical analysis, and prepared the first draft of the manuscript, DK, RR, and NG explained and interpreted the data and contributed to preparing the final draft of the manuscript. All authors read and approved the manuscript.

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