



Original Research Article

A CROSS-SECTIONAL STUDY OF THE PREVALENCE AND SPECIFIC PATTERNS OF CARIES IN A POPULATION ATTENDING THE DENTAL HOSPITAL IN PAKISTAN

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Received : 23/05/2026
Received in revised form : 20/07/2026
Accepted : 28/07/2026

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DOI: 10.70034/ijmedph.2026.3.269

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 1694-1698

ABSTRACT

Background: Dental caries is a chronic microbial disease, which is posing a huge health burden on the population worldwide, not only with respect to oral health but also in relation to general health of people. The purpose of this study was to find out the prevalence and distribution of dental caries in the dental hospital attendees.

Materials and Methods: A descriptive cross sectional study was done at Frontier Medical and Dental College Hospital Abbottabad, over a four-month period (Feb to May 2026). Our sample consisted of 740 patients, 442 males and 298 females. Examination of caries was done according to the WHO criteria (1997) on dentition status and treatment need and the mouth mirror and ball-ended probe was used.

Results: Out of 740 patients ((57%) 442 males, 298 (43%) females), 48% (n=355) had dental caries. Males were significantly more likely to have prevalence than females, 57% versus 43%, respectively (p<0.05). The most frequent teeth were second molars (posterior teeth).

Conclusions: This population had a significant caries burden, predominantly in males and the posterior teeth. The second molars were prominently involved, presenting a potential problem with maintaining the accessibility of oral hygiene and dietary habits. The findings highlighted the importance of better preventive dental care, patient education about effective cleaning of posterior teeth, and promoting awareness of oral health to help decrease prevalence.

Keywords: Cross-sectional study; Dental Caries; Tooth, Molar; Hospital, Dental; Pakistan.

INTRODUCTION

Dental caries is a chronic microbial disease that results in the demineralization and re-mineralization of the tooth,^[1,2] and is one of the most prevalent worldwide health issues. It is a progressive condition but preventable and treatable condition in early stages.^[3] It was said to be a 'pandemic' because of the increased prevalence of retained carious teeth with pain, discomfort and functional

issues at a global level.^[1] Dental caries being a multifactorial disease, may have serious impact on oral as well as general health of affected communities.^[4]

Several Studies have shown wide spread prevalence of untreated caries in underdeveloped countries like Pakistan.^[5] and some oral health surveys indicate Pakistan as a low-caries country with oral disease equally prevalent among urban and rural communities with majority of the young children

being caries-free.^[6,7] But in recent years, epidemiological information indicates that the prevalence of caries in Pakistan is on the rise specially in adults and older children, which may be attributed to the rising consumption of sugary food, urbanization and lack of preventive dental services.^[8]

Dental caries prevalence and pattern are age and sex dependent and also dependent on socio-economic status, race and geographical position as well as on food habits and oral hygiene practice.^[9,10] Sex differences in caries experience have been suggested more and more recently, with some studies indicating higher numbers of caries in females related to the factors of earlier tooth eruption and hormonal effects,^[11] and others, mostly in South Asian settings, suggesting a higher number of caries in males, based on differential access to dental services and the consumption of risk behaviors.^[11]

The posterior teeth, particularly the molars, and the mandibular arch are among the most common areas for caries to form and are consistently recognized as high risk areas because of their complex morphology, deep pits and fissures, and being primary mastication surfaces.^[12] The pattern of caries seen in the area is important in planning area-specific preventive strategies such as sealant programs, patient education for effective cleaning of posterior teeth, and other preventive measures.

Our aim of the study was to find out the prevalence and distribution pattern of dental caries among the patients visiting to the Frontier Dental College Hospital Abbottabad.

MATERIALS AND METHODS

This study was a cross sectional study conducted from February to May 2026, at the Frontier Medical and Dental College Abbottabad, among the patients visiting the hospital. A total of 740 patients (442 males and 298 females) were involved in the study. Patients of all ages and sex visiting the outpatient clinic during the study period were included except the patients with fully edentulous arches, active orthodontics treatment and those having severe systemic condition where oral examination was precluded. Patients were asked to brush and rinse their mouths and have their teeth dried with a cotton swab prior to examination. Two trained dental surgeons who were calibrated (kappa coefficient 0.85) examined and assessed dental caries based on the WHO 1997 dentition status and treatment needs, using a mouth mirror and a ball-ended probe. Carious teeth were recorded on specially-designed sheets, only if the cavities were visible under room light and dental chair light. Oral health instructions were given and patients with treatment needs were referred to the concerned departments

Statistical Analysis: The data were statistically analyzed using SPSS Version 26.0. All the variables were subjected to descriptive statistics, such as frequencies and percentages. The chi-square (χ^2) test of independence was used to compare categorical variables, such as: caries prevalence between males and females; caries distribution between maxillary and mandibular arch; caries distribution between anterior and posterior teeth; and caries distribution among different tooth types. A p value of < 0.05 was considered statistically significant and 95% confidence intervals were provided where relevant. Two-tailed tests were performed for all tests.

RESULTS

Table 1: Study Population and Caries Prevalence

Characteristics	Number 'n'	%	p-value
Total No of patients examined	740	100 %	
Male patients	442	62 %	
Female patients	298	38 %	
Caries Prevalence			
Patients with Carious teeth	355	48 %	
Male patients having carious teeth	202	57 %	0.009*
Female patients having Dental caries	153	43 %	

*Statistically significant difference between males and females ($\chi^2 = 6.84$)

Table 1 demonstrates that the population, 740 patients of both sexes (442 males and 298 females) and the caries prevalence of 48% (n=355) among the patients seen, (males n=202, females n= 153). The difference was statistically significant statistically ($\chi^2 = 6.84$, p = 0.009).

Table 2: Arch-wise distribution of dental caries

Characteristics	Mandible n (%)	Maxilla n (%)	p-value
Arches affected by caries	231 (65%)	124 (35%)	<0.001
Males	137 (68%)	65 (32%)	0.004
Females	104 (67.7%)	49 (32.3%)	0.005

χ^2 test for comparison between mandible and maxilla

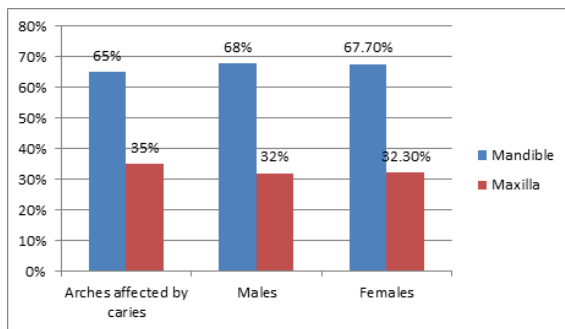


Figure 1: Arch wise frequency of occurrence of dental caries among male and female patients

Figure 1 Illustrates the frequency of dental caries in the jaws. Caries was higher in mandible (65%) than maxilla (36%). Among males, the mandible showed a higher caries prevalence of 68% compared to maxilla (32%), and the difference was statistically significant ($\chi^2 = 8.12$, $p = 0.004$). Similarly in females, caries was 67.7% in mandible compared to maxilla (32.3 %) and the difference was statistically significant ($\chi^2 = 7.95$, $p = 0.005$).

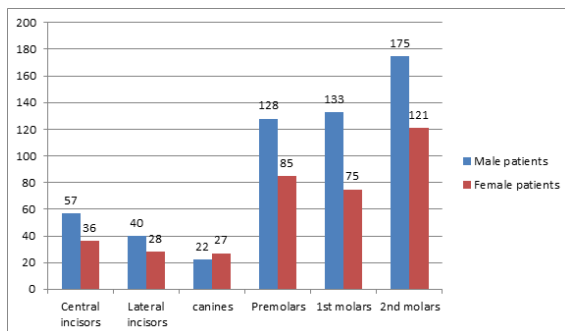


Figure 2: Graphical Presentation of Pattern of teeth affected with Dental Caries

Figure 2 presents the tooth-wise occurrence of dental caries. In both sexes, Posterior teeth (premolars and molars) were significantly more affected than anterior teeth (incisors and canines) ($\chi^2 = 42.6$, $p < 0.001$). Among molars, 2nd molars showed the highest prevalence (83.4%) compared to 1st molars (58.6%).

DISCUSSION

Dental caries is one of the most widespread chronic diseases worldwide and a major public health problem in all age groups and geographical areas.^[1,2,3] The objectives of this investigation are to identify the prevalence and pattern of dental caries in the population attending the dental college hospital, Abbottabad, which will confirm the significant burden of the preventable disease in the population.

Overall, 48% of patients (355 out of 740) had dental caries. [Table 1] This is in line with the previous findings in Pakistan and other developing countries with a slightly lower figure compared to some national estimates.^[5,6,7] The meta-analysis of

prevalence rates of caries in South Asian populations varied from 45% to 65%, and there was a high degree of heterogeneity depending on geographic location, socioeconomic status and diet.^[8] The moderate prevalence found in our study may be explained by the sampling method used, which was hospital-based and may not be representative of the burden in the underserved rural population, where access to dental services is poor.

Table 1 shows that, caries was more prevalent in males 202 (57%) than in females 153 (43%) and the difference was significant statistically ($\chi^2 = 6.84$, $p = 0.009$) in the study population. The higher caries prevalence among males is in contrast to some international studies, where females had a higher prevalence, likely due to hormonal changes related to pregnancy, dietary changes and earlier tooth eruption.^[9,10] Our results are consistent with recent data for the region. Another cross-sectional study carried out in 2023 in KPKH also found that males were more likely to have caries (54.2%) than females (45.8%) and attributed this finding to gender-specific exposures at work, smoking and the difference in seeking dental treatment.^[11] In addition, a 2025 population based survey conducted in Punjab found that the mean DMFT score of the male adults was significantly higher than that of the female adults due to poor oral hygiene and delayed dental visits.^[13] Gender differences in caries prevalence within our sample could also be attributed to cultural practices, as males are more likely to attend hospital when the need is emergent whereas females are more likely to attend primary care or private providers.

Arch-wise caries occurrence showed a marked predilection for the mandible (65%) over the maxilla (35%), observed in both sexes (males: 68% vs. 32%, $\chi^2 = 8.12$, $p = 0.004$; females: 67.7% vs. 32.3%, $\chi^2 = 7.95$, $p = 0.005$). [Figure 1] It was well established in the literature and thought to be primarily due to the fact that the pits and fissures are deeper in the molars of the mandible and that the occlusal surfaces are primary masticatory surfaces that trap food and plaque.^[12,14] The higher scores of demineralization in mandibular teeth (compared to maxillary teeth) despite better oral hygiene and fluoride exposure are also reported by the recent 2024 cohort study on quantitative light-induced fluorescence (QLF) technology.^[15] Furthermore, a recent systematic review for 2025 on caries site-specificity concluded that the vulnerability of the mandibular arch is multi-factorial, namely including the following:

As in figure 2, the dental caries incidence of posterior teeth was more than that of anterior teeth in both male and female patients, mostly 2nd molars are affected followed by 1st molar, and premolars. This trend is consistent with classic epidemiological findings of pedodontics and adults regarding posterior teeth.^[9,14,17] The difference in susceptibility to caries may be attributed to the morphology and fissure topography of teeth as revealed by recent 3D

micro computed tomography study, which indicated that the fissure and pits of 2nd molars are generally more pronounced with ability for food impaction, retention and accumulation of bacteria.^[18] In a similar manner, a multicenter cross-sectional study conducted in the Middle East in 2024 showed that the mandibular 2nd molar was the most affected tooth,^[19] which corroborates our findings. The tendency toward second molars also emphasises the challenge of cleaning those most distal teeth and especially when third molars begin to erupt and can form plaque holding pockets.

Our findings have major clinical and public health implications. Since there is high caries prevalence in the second molars of mandible, it is presumed that the routine oral hygiene advice regarding buccal and lingual surfaces may be inadequate. A 2025 randomized controlled trial showed that a 18-month intervention with targeted education of interproximal and distal surface cleaning combined with the use of single tufted brushes reduced the incidence of second molar caries, significantly compared to routine instructions on brushing.^[20]

The same results hold true for school and community-based preventive programs that include supervised fluoridated tooth brushing and sealant application for newly erupted permanent molars, which have demonstrated a 60–70% caries reduction in high-risk populations through a 2023 Cochrane review update.^[21]

Our findings are even more relevant in today's context of the latest advances in caries risk evaluation and preventive therapeutics. With increasing availability in clinical settings, several caries detection systems have been developed using artificial intelligence (AI) to detect early demineralization on bitewing radiographs with sensitivity more than 90% prior to cavitation, which allows for non-invasive intervention prior to the development of a cavity.^[22] Moreover, with the availability of silver diamine fluoride (SDF) as a minimally invasive method for caries arrest in high-risk patients, recent meta-analyses have reported caries arrest rates of 80% in primary and permanent molars.^[23] Incorporating these evidence-based prevention strategies into the practice of Frontier Dental College Hospital could significantly reduce burden of posterior caries in this population.

Limitations of the study need to be recognised. The cross-sectional design does not allow causal inference, and the sampling of the hospital could lead to selection bias and to over-representation of patients with symptomatic or advanced caries. Further, we were not able to measure the frequency of oral hygiene, socioeconomic status, fluoride exposure or dietary habits, which are all established confounders. Longitudinal studies with validated caries risk assessment tools (Cariogram or CAMBRA) and salivary biomarker analysis are recommended to explain the observed pattern in the future.^[24]

CONCLUSION

The findings of this study indicate that the dental caries is a common disease affecting general population and more prevalent mandibular posterior teeth. Education of communities on the risk factors for dental caries and teaching good oral hygiene and brushing technique is important for health professionals and dentists. This disease burden is largely due to lack of education and poor quality of life. School and community level oral health programmes should be planned to improve the awareness of people regarding the improvement in oral hygiene, to control and reduce the incidence of dental caries. However, the implementation of preventative care measures such as sealant programs, fluoride therapies and patient-specific oral hygiene education will be pivotal in reducing disease burden in this population.^[21,23,24]

Acknowledgment

The Authors acknowledge the use of deepseek and ChatGPT (OpenAI, GPT-4) for language editing, grammar correction, and improving manuscript readability. No artificial intelligence tool was used for data analysis, statistical interpretation, or the generation of scientific conclusions. The authors assume full responsibility for the accuracy and integrity of the work.

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