Original Article

# Frequency of Dental Caries and Associated Factors Among Patients Attending the Peshawar Dental College and Hospital: A Hospital-Based Cross-Sectional Study

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## ABSTRACT

**Objective:** To determine the frequency of dental caries and associated factors among patients attending the Peshawar Dental College and Hospital.

**Study Design:** Hospital-based cross-sectional study

**Place and Duration of Study:** This study was conducted at the Department of Operative Dentistry and Endodontic of Peshawar Dental College and Hospital during the study period from September 2023 to December 2023.

**Methods:** A total of one hundred & thirty-six patients meeting inclusion criteria utilizing a convenient sampling method were recruited for the study. Data collection was carried out using structured questionnaires and clinical examinations. Clinical examination was performed by cleaning and drying the teeth and using a mouth mirror with adequate light and a ball-end Community Periodontal Index (CPI) probe. Dental caries were identified when a lesion was observed in the pit or fissure, or on a smooth surface, characterized by a detectable soft floor, undermined enamel, soft wall, or temporary restoration. The Chi-square test was employed with a significance level of $P \leq 0.05$ to assess potential associations of categorical variables.

**Results:** The frequency of dental caries among patients was found to be 85% with varying degrees of severity. The mean age of the participants was $33 \pm 12.66$ years and ranged from 13 to 80 years. Aspects including age, oral hygiene routines, dietary patterns, and socioeconomic status displayed significant association with the presence of dental caries ($p < 0.05$). Poor oral hygiene practices and frequent use of sugary meals were the most major risk factors.

**Conclusion:** Dental caries frequency was notably influenced by factors such as oral hygiene status, level of education, and income level. Patients with poor oral hygiene, lower educational levels, and lower income were identified as having at heightened susceptibility to caries

**Key Words:** Dental caries, hygiene, sugar meals, risk factors

## INTRODUCTION

Dental caries is commonly described as a microbial infection that causes significant damage to teeth by breaking down their inorganic and organic components through demineralization and dissolution.[1] Dental caries, commonly known as tooth decay, is a prevalent chronic disease characterized by the breakdown of tooth structure due to bacterial action. It affects individuals of all ages and socioeconomic backgrounds, posing significant public health challenges globally.[2] Studies have indicated a high prevalence of caries among both children and adults, often resulting in discomfort and pain.[3] The primary culprits implicated in the development of caries are acid-producing bacteria such as Streptococci and Lactobacilli.[4] Risk factors contributing to its occurrence include socioeconomic status, educational level, lifestyle factors and dietary habits.[5]

In developing nations, the increased prevalence of dental caries is linked to various factors, including unhealthy dietary patterns, inadequate and inappropriate public health services, limited access to such services, and insufficient utilization of fluoride.[4] Conversely, the reduction in caries prevalence in developed countries is

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credited to changes in dietary habits regarding sugar consumption, improved oral hygiene practices, increased involvement in oral health initiatives, and the implementation of population-wide preventive programs.[6]

In Sudan, a study reported a dental caries prevalence of 30.5%,[7] while research in Kenya found it to be 37%. Lack of awareness about the causes and preventive measures of the disease was cited as a primary factor contributing to this figure.[8] The World Health Organization recommends conducting epidemiological surveys every five years to monitor oral health status within communities.[9] Despite global efforts to improve oral health, challenges persist, particularly among underprivileged populations in developing nations. Early detection of oral diseases is essential for effective management and conducting thorough visual oral examinations with proper lighting can aid in identifying such conditions at early stages.[10]

Dental caries would be prevented by appropriate hygienic ways. Early detection and timely treatment are pivotal in preventing further damage and preserving teeth. It's crucial to comprehend the frequency of caries and the factors associated with it to devise effective prevention and management strategies. Creating awareness about oral health and preventive measures against dental caries is imperative. Additionally, implementing initiatives to provide dental care services at the primary level is essential.

The objective of this study was to assess the frequency of caries and its related risk factors among patients attending the Peshawar Dental College and Hospital. By examining various socio-demographic, behavioral, and clinical aspects, this research seeks to provide valuable insights into the epidemiology and determinants of caries.

The study's findings have the potential to impact public health treatments and policies targeted at reducing the burden of caries and promoting oral health in communities.

## METHODS

This study employed a hospital-based cross-sectional design to investigate the frequency of dental caries and associated factors among patients attending Peshawar Dental College and Hospital. The research was conducted at Peshawar Dental College and Hospital located in Peshawar, Pakistan. As a tertiary care dental facility, it serves a diverse patient population from various socio-economic backgrounds. Ethical approval was obtained from the institutional review board of Prime Foundation, before the commencement of the study. A verbal informed consent was obtained from all participants, and confidentiality of their personal information was ensured throughout the study.

A convenient sampling method was utilized to recruit participants for the study. Patients presenting to the Department of Operative Dentistry and Endodontic of Peshawar Dental College and Hospital during the study period from September 2023 to December 2023, were invited to participate. The sample size was calculated based on the estimated prevalence of dental caries in similar populations, with a confidence level of 95% and a margin of error of 0.05, turning to one hundred and thirty-six. The healthy patients with the age above 13 years among both genders were included. Patients suffering from systemic diseases and those who were not cooperative were excluded from the study.

Data collection was carried out on structured questionnaires after clinical examinations. The questionnaire included socio-demographic information (e.g., age, gender, education level, income), and oral health-related behaviors (e.g., oral hygiene practices, dietary habits). Clinical assessments were conducted to evaluate the presence and severity of caries using standardized diagnostic criteria. Clinical examination was performed by cleaning and drying the teeth and using mouth mirror with adequate light and ball-end Community Periodontal Index (CPI) probe. Dental caries were identified when a lesion was observed in the pit or fissure, or on a smooth surface, characterized by a detectable soft floor, undermined enamel, soft wall, or temporary restoration.

Statistical analysis was conducted using appropriate software, SPSS, 21. Descriptive statistics were used to summarize the characteristics of the study population and the frequency of dental caries. To assess potential associations, the Chi-square test was employed. A significance level of $P \leq 0.05$ was utilized to determine statistical significance.

## RESULTS

**Table No.I: Socio-demographic status of the participants.**

| Variables | | Number | Percent |
|---|---|---|---|
| Gender | Male | 57 | 41.9 |
| | Female | 79 | 58.1 |
| Marital Status | Married | 82 | 60.3 |
| | Unmarried | 54 | 39.7 |
| Socioeconomic status | Low | 54 | 39.7 |
| | Medium | 58 | 42.6 |
| | High | 24 | 17.6 |
| Educational status | Illiterate | 46 | 33.8 |
| | Matric | 23 | 16.9 |
| | Intermediate | 29 | 21.3 |
| | Graduate | 19 | 14.0 |
| | postgraduate | 19 | 14.0 |
| | Poor | 37 | 27.2 |

The mean age of patients was $33 \pm 12.66$ and ranged from 13 to 80 years. Two-thirds of the patients were in the age group of 13-35 years. In terms of gender, 42 % were male while 58% were female with dental caries. (Table 1)

**Table No.2: Oral hygiene status and tooth brushing Habits of the participants**

| Habit of Tooth Brushing | | Number | Percentage |
|---|---|---|---|
| Oral Hygiene status | Good | 35 | 25.7 |
| | Fair | 64 | 47.1 |
| | Poor | 37 | 27.2 |
| Tooth Brushing Habit | Yes | 111 | 81.6 |
| | No | 25 | 18.4 |
| Brushing Frequency | Once a day | 49 | 36 |
| | Twice a day | 34 | 25 |
| | More than twice a day | 3 | 2.2 |
| | Weekly | 6 | 4.4 |
| | Usually | 19 | 14.0 |
| | NA | 25 | 18.4 |
| Time of tooth brushing | Morning | 63 | 46.3 |
| | Night | 6 | 4.4 |
| Type of tooth paste | NA | 67 | 49.3 |
| | Fluoridated | 81 | 59.6 |
| | Non fluoridated | 31 | 22.8 |

Table 2 demonstrates that the majority of patients had fair oral hygiene status. Over 80% of the participants in the study had a habit of brushing their teeth. Among those who brushed, about 25% brushed their teeth twice a day. Interestingly, only 18% of the participants were not brushing their teeth. About 60 % of the study participants used fluoridated toothpaste.

Table 3 shows that 36% consumed carbohydrates twice a day. The majority of the participants (83%) were not using tobacco in any form. Dental caries were detected in 85.3% of participants, while 14.7% had no detectable caries. Finally, caries risk was categorized as follows: 14% were at low risk, 50.7% were at moderate risk, and 35.3% were at high risk.

Table 4 provides an association of different variables among type of caries risk and P values.

**Table No.3: Carbohydrate intake, tobacco use and caries status among the participants.**

| | | Number | Percentage |
|---|---|---|---|
| Sugar food consumption | Yes | 126 | 92.6 |
| | No | 10 | 7.4 |
| Frequency of sugar consumption | Once a day | 35 | 25.7 |
| | Twice a day | 49 | 36.0 |
| | More than twice a day | 31 | 22.8 |
| | Usually | 11 | 8.1 |
| | NA | 10 | 7.4 |
| Use of tobacco in any form | Yes | 23 | 16.9 |
| | No | 113 | 83.1 |
| Type of tobacco used | Smoked | 15 | 11.0 |
| | Smokeless | 8 | 5.9 |
| | NA | 113 | 83.1 |
| Dental Caries | Detected | 116 | 85.3 |
| | Undetected | 20 | 14.7 |
| Caries risk | Low risk | 19 | 14.0 |
| | Moderate risk | 69 | 50.7 |
| | High risk | 48 | 35.3 |

**Table No.4: Association of different variables among type of caries risk.**

| Variable | Categories | Type of caries risk | | | P Value |
|---|---|---|---|---|---|
| | | Low risk | Moderate risk | High risk | |
| Gender | Male | 7(12.3%) | 34(59.6%) | 16(28.1%) | 0.20 |
| | Female | 12 (15.2%) | 35(44.3%) | 32(40.5%) | |
| Marital status | Married | 7(8.5%) | 39(47.6%) | 36(43.9%) | 0.01 |
| | Unmarried | 12(22.2%) | 30(55.6%) | 12(22.2%) | |
| Socioeconomic status | Low | 3(5.6%) | 22(40.7%) | 29(53.7%) | 0.001 |
| | Medium | 9(15.5%) | 36(62.1%) | 13(22.4%) | |
| | High | 7(29.2%) | 11(45.8%) | 6(25.0%) | |
| Educational Status | Illiterate | 0(0.0%) | 14(30.4%) | 32(69.6%) | 0.000 |
| | Matric | 2(8.7%) | 15(65.2%) | 6(26.1%) | |
| | Intermediate | 3(10.3%) | 20(69.0%) | 6(20.7%) | |
| | Graduate | 5(26.3%) | 11(57.9%) | 3(15.8%) | |
| | Postgraduate | 9(47.4%) | 9(47.4%) | 1(5.3%) | |
| Oral hygiene status | Good | 16(45.7%) | 17(48.6%) | 2(5.7%) | 0 .000 |
| | Fair | 3(4.7%) | 44(68.8%) | 17(26.6%) | |
| | Poor | 0(0.0%) | 8(21.6%) | 29(78.4%) | |
| Tooth Brushing Habits | Yes | 19(17.1%) | 66(59.5%) | 26(23.4%) | 0.000 |
| | No | 0(0.0%) | 3(12.0%) | 22(88.0%) | |

# DISCUSSION

The study revealed that the prevalence of dental caries was 85%, surpassing rates found in Lithuania (78.3%),[11] Brazil (75%),[12] Kenya (37%),[13] Sudan (30.5%)[14], Ethiopia Finote Selam city (48.5%),[15] and Bahirdar city Ethiopia (21.8%).[16] The higher frequency observed in this study could be attributed to differences in the study population, timing, and setting. Being institution-based, there might be a greater influx of patients in healthcare facilities compared to community-based studies, possibly influencing the results. This underscores the importance of promoting oral health discrepancies with studies from Brazil, Kenya, and Sudan could stem from variations in study populations and socio-demographic factors among these countries.

The frequency of developing dental caries was more in females (23%) compared to males (16%) in the present study, which is in line with a study done in China. [17]

The frequency of developing dental caries was more in the younger population (13-35 years) compared to older ones (more than 57 years). This discovery aligns with findings from a national oral health survey conducted in China [18] and Palestine [19] which reported dental caries rates of 55.3% and 54.35% respectively among children aged 12 and above. Additionally, a meta-analysis encompassing Eastern Mediterranean countries revealed a prevalence of 65% (for primary dentition), 66% (for mixed dentition), and 70% (for permanent dentition).[20]

The current research discovered that individuals with good oral hygiene had lower rates of dental caries compared to those with poor oral hygiene with a significant P value (0.05). This result aligns with studies conducted by Selam [14] in the City of Ethiopia. Furthermore, the study highlighted that individuals who lacked formal education were 70% more likely to be at risk compared to those who had attended formal education, consistent with a similar study conducted in Gondar.[21]

The study revealed that individuals with lower monthly incomes had higher rates of dental caries compared to those with higher incomes, a trend consistent with research conducted in Gondar town. It suggests that as family income rises, the likelihood of dental decay decreases. This could be explained by the ability of higher-income individuals to afford dental hygiene products, contributing to better oral health outcomes.

Patients with no habit of using toothbrushes have a high caries risk compared to those who use them twice a day. Similarly, patients with carbohydrate intake and more frequent consumption have a high caries risk compared to those with no carbohydrate intake, which corresponds with studies done in Brazil, [12] Kenya[13] and Ethiopia.[15]

The strengths of the study were that it was conducted within a dental college and hospital environment providing access to a diverse patient population, ensuring a broad representation of individuals seeking dental care. By examining both the frequency of dental caries and associated factors, the study offers a comprehensive understanding of the oral health status and potential determinants among the patient population.

Since the study was conducted in a hospital setting, the patient population may not represent the general population, as it primarily includes individuals seeking dental care, potentially leading to sampling bias. Second, the sample size was not large enough so the findings may not be generalizable to the wider population beyond those attending the Peshawar Dental College and Hospital, limiting the external validity of the results. Acknowledging these limitations is important for interpreting the study findings accurately and for guiding future research efforts to address gaps in knowledge and improve the validity and reliability of findings in this area.

The current study provides valuable insights into the dental health status of adults across much of the Peshawar region. This information serves as a crucial foundation for health policymakers and government officials, enabling them to develop targeted preventive strategies and treatment programs for dental conditions. By focusing on improving access to quality dental services, these initiatives aim to enhance the overall living standards of the population.

# CONCLUSION

Dental caries were detected in 85.3% of participants. Two-thirds of the patients were in the age group of 13-35 years. Female were more affected than males. Patients with poor oral hygiene, lower educational attainment and lower income were at higher risk of dental caries.

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