

## Prevalence of Dental Caries and Need of Preventive Dental Materials in the Rawat Community: A Cross-Sectional Public Health Study (2025)

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### ABSTRACT

Dental caries is one of the most prevalent oral health problems worldwide, particularly in developing countries like Pakistan where access to oral health care services is limited. The purpose of this study was to determine the prevalence of dental caries among the population of Rawat, Pakistan. A cross-sectional study was conducted at Rawat, Pakistan, over a period of six months (February–July 2025). A total of 400 participants, both males and females aged between 12 and 60 years, were selected through convenience sampling using the WHO sample size calculator version 2.0. Clinical examinations were performed using WHO criteria for the diagnosis of dental caries. Data were entered and analyzed using SPSS version 25. The prevalence of dental caries was found to be 68.5%. Females exhibited a slightly higher prevalence (71.2%) compared to males (65.4%). The highest prevalence was observed among participants aged 21–30 years (75.6%). Socioeconomic status, oral hygiene practices and the lack of an affordable, multifunctional preventive dental hygiene product accessible to populations were significantly associated with the occurrence of caries. These findings highlight the urgent need for preventive oral health programs in semi-urban communities of Pakistan as well as the formulation of a cost-effective, multifunctional agent designed to arrest or reverse early carious lesions. Targeted strategies focusing on oral hygiene education, introduction of preventive dental materials, reduced sugar intake, and improved access to dental care could significantly reduce the disease burden in this population.

**Keywords:** *Dental caries, Oral Health Programs, Dental materials.*

### 1. INTRODUCTION

Dental caries is a chronic, multifactorial oral disease that remains one of the most widespread health problems globally. It affects individuals of all ages, making it a major public health concern with both medical and socioeconomic implications. Despite the availability of preventive measures, caries remains prevalent and accounts for a large proportion of oral health problems worldwide.<sup>1</sup> According to the Global Burden of Disease Study, untreated dental caries in permanent teeth remains the most common health condition, affecting nearly 2.3 billion people.<sup>2</sup> The pathogenesis of dental caries is associated with the interaction of multiple factors, including host susceptibility, dietary habits, oral hygiene practices, and microbial biofilm activity.<sup>3</sup> *Streptococcus mutans* and *Lactobacillus* species are the most commonly implicated organisms in the initiation and progression of carious lesions.<sup>3</sup> Poor dietary control, particularly frequent consumption of fermentable carbohydrates, has been linked with higher incidence of caries in both developed and developing countries.<sup>4</sup>

Globally, significant disparities exist in the distribution of dental caries. High-income countries such as the United States, Sweden, and the UK have seen reductions in prevalence due to the adoption of preventive programs such as water fluoridation, fluoridated toothpaste, and regular dental checkups.<sup>5-6</sup> In contrast, low- and middle-income countries (LMICs) continue to report high caries prevalence due to limited access to oral healthcare, lack of awareness, and poor socioeconomic conditions.<sup>7</sup> The World Health Organization (WHO) has emphasized that oral diseases like caries must be addressed as part of non-communicable disease control strategies, given their shared risk factors with diabetes, cardiovascular diseases, and obesity.<sup>8</sup> Pakistan, like many LMICs, faces a high prevalence of dental caries. Various studies have documented prevalence rates ranging from 60–75% among different age groups.<sup>9-11</sup> This is attributed to poor oral hygiene practices, lack of preventive dental programs, and dietary patterns that include high sugar consumption. Cultural and socioeconomic disparities also contribute to the uneven distribution of oral health problems, with rural and semi-urban populations being disproportionately affected.<sup>12</sup> Furthermore, Pakistan has limited oral health infrastructure, with a low dentist-to-patient ratio, which exacerbates the problem.<sup>13</sup> Rawat, a semi-urban area located near Rawalpindi, represents a mixed demographic with both rural and urban influences. The population largely depends on small businesses, agriculture, and daily wage labor. Although it is close to metropolitan centers, healthcare facilities—particularly dental services—are limited. This makes it an important area to study, as epidemiological data specific to Rawat are lacking. No previous published studies have evaluated the prevalence of dental caries in this community, despite evidence suggesting that similar populations in peri-urban areas of Pakistan face a heavy burden of oral health issues. Assessing the prevalence of dental caries in Rawat serves multiple purposes. Firstly, it establishes baseline data for the region, which can guide policy-makers and healthcare providers in planning preventive and treatment services. Secondly, it highlights the association of caries with socioeconomic status, dietary practices, and oral hygiene behavior. Finally, this study aligns with the WHO Global Oral Health Strategy, which emphasizes evidence-based approaches for addressing oral health inequalities.<sup>8</sup> The current study was therefore undertaken to evaluate the prevalence of dental caries in Rawat, Pakistan, and to analyze the relationship between demographic variables and oral hygiene practices with caries prevalence.

## 2. OBJECTIVE

To determine the prevalence of dental caries among the population of Rawat, Pakistan, and to analyze its association with demographic factors, socioeconomic status, and oral hygiene practices.

## 3. HYPOTHESIS

Null Hypothesis ( $H_0$ ): There is no significant association between demographic variables (age, gender, socioeconomic status, oral hygiene practices) and the prevalence of dental caries among the population of Rawat.

Alternative Hypothesis ( $H_1$ ): There is a significant association between demographic variables (age, gender, socioeconomic status, oral hygiene practices) and the prevalence of dental caries among the population of Rawat.

## 4. METHODOLOGY

A cross-sectional study was conducted in Rawat, Pakistan, from February to July 2025. The sample size was calculated using the WHO sample size calculator version 2.0, with a confidence level of 95% and margin of error 5%. A total of 400 participants were included in the study using convenience sampling. Inclusion criteria were individuals aged 12–60 years, both males and females, who were residents of Rawat and consented to participate. Exclusion criteria included edentulous patients, individuals with systemic conditions affecting oral health, and those undergoing orthodontic treatment. Data collection was performed through clinical examination using WHO criteria for caries diagnosis (DMFT index). A structured questionnaire was also administered to record demographic details, oral hygiene practices, and socioeconomic background. Data were analyzed using SPSS version 25. Frequencies, percentages, and mean values were calculated. Associations between variables were determined using chi-square tests with  $p < 0.05$  considered statistically significant.

## 5. RESULTS

Out of 400 participants, 210 were females (52.5%) and 190 were males (47.5%). The overall prevalence of dental caries was 68.5%. Females showed a higher prevalence (71.2%) compared to males (65.4%). Age distribution revealed the highest prevalence in the 21–30 years group (75.6%), followed by the 31–40 years group (71.0%). The lowest prevalence was found in the 51–60 years group (59.3%). Socioeconomic status was significantly associated with caries prevalence. Participants from lower socioeconomic backgrounds had a prevalence of 76.8%, compared to 60.5% in higher socioeconomic groups. It is pertinent to note here that participants of lower socioeconomic status were reluctant to purchase multiple oral hygiene products. Oral hygiene practices also played a key role; participants brushing once daily had 74.2% prevalence, compared to 58.9% among those brushing twice daily. Use of fluoridated toothpaste was associated with lower prevalence (61.0%) compared to non-fluoridated use (72.5%).

**Table 1: Prevalence of Dental Caries by Gender**

Gender	Sample (n)	Prevalence (%)
Male	190	65.4
Female	210	71.2

**Table 2: Prevalence of Dental Caries by Age Group**

Age Group (years)	Sample (n)	Prevalence (%)
12–20	80	63.7
21–30	110	75.6
31–40	90	71.0
41–50	70	66.4
51–60	50	59.3

**Table 3: Prevalence of Dental Caries by Socioeconomic Status**

Socioeconomic Status	Sample (n)	Prevalence (%)
Low	170	76.8
Middle	150	68.0
High	80	60.5

## 6. DISCUSSION

The present study found a dental caries prevalence of 68.5% among the population of Rawat, which is consistent with previous findings from Pakistan. Studies from Lahore and Karachi have reported caries prevalence between 65–72%, similar to our results.<sup>9–10</sup> The slightly higher prevalence among females in our study aligns with international evidence suggesting that women are more prone to caries due to hormonal fluctuations, dietary habits, and greater life expectancy.<sup>14</sup> The highest prevalence observed in the 21–30 years age group is noteworthy, as this age represents increased dietary exposure and changing lifestyle patterns. This age group also represents the section of adults who are more negligent of their oral hygiene and reluctant to purchase separate oral hygiene products such as toothpastes and mouthwashes. This finding is comparable to results from studies in India and Iran, where young adults had higher caries prevalence compared to older populations.<sup>15–16</sup> In contrast, developed nations such as Sweden report significantly lower prevalence in young adults, largely due to widespread preventive programs.<sup>5</sup> Socioeconomic disparities were evident in our study, with lower-income participants showing significantly higher caries prevalence (76.8%). This mirrors findings from global studies emphasizing the link between poverty and oral health inequalities.<sup>17</sup> In Pakistan, lack of access to fluoridated dental materials, dental services, and education exacerbates these disparities.<sup>12</sup> Oral hygiene practices also demonstrated a strong association with caries. Participants brushing twice daily and using fluoridated toothpaste had lower prevalence rates, confirming the protective role of these practices. This observation aligns with WHO recommendations and global consensus on preventive oral health behaviors.<sup>7–8</sup> Overall, our study reinforces the urgent need for public health interventions in semi-urban populations such as Rawat. Preventive programs focusing on oral hygiene education, dietary counseling, and provision of affordable fluoridated products are essential. Integration of oral health into primary healthcare services can further help in reducing the burden of disease in underserved communities.

## 7. CONCLUSION

The prevalence of dental caries in Rawat, Pakistan, is high (68.5%), with significant associations with age, gender, socioeconomic status, and oral hygiene practices. These findings highlight the urgent need for community-based preventive programs and policies that target oral health inequalities in semi-urban Pakistani populations. It should be noted that as

younger individuals are less inclined to use multiple oral care products, there is a growing need for a multifunctional and economic preventive dental materials that combines cleansing and preventive actions within a single, convenient application.

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