

## RELATIONSHIP BETWEEN MALOCCLUSION AND DENTAL CARIES IN ADOLESCENCE VISITING IN DENTAL TEACHING HOSPITAL PESHAWAR

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#### Keywords:

Malocclusion, Adolescents, Dental Aesthetic Index (DAI), Decayed, Missing, and Filled Teeth (DMFT), Orthodontic assessment, Oral health, Oral hygiene, Peshawar

Received on 26 Oct, 2025

Accepted on 12 January, 2026

Published on 28 January, 2026

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### Abstract

#### Background:

Malocclusion and dental caries are among the most common oral health issues affecting adolescents globally. Malocclusion, defined as irregular alignment or positioning of the teeth and jaws, can create favorable conditions for plaque retention, thereby increasing the risk of dental caries. Despite global studies highlighting this association, limited evidence exists from Pakistan, particularly within the adolescent population of Peshawar.

#### Objective:

The objective of this study was to evaluate the relationship between malocclusion and dental caries in adolescents attending the orthodontic ward of Sardar Begum Dental Hospital, Peshawar.

**Methods:**

A descriptive cross-sectional study was conducted involving 495 adolescents aged 10 to 19 years. Data were collected using a structured questionnaire and clinical examination. The Dental Aesthetic Index (DAI) was used to assess malocclusion, while dental caries were recorded using the Decayed, Missing, and Filled Teeth (DMFT) index. Descriptive statistics, chi-square tests, and ANOVA were used for analysis.

**Results:**

The findings showed that 57.6% of participants had very severe malocclusion requiring mandatory treatment, while only 6.7% had no caries experience. The mean DMF score was 5.52 and the mean DAI score was 25.37. Statistical analysis revealed a significant association between increasing malocclusion severity and higher DMFT scores ( $p < 0.001$ ).

**Conclusion:**

This study confirmed a strong positive association between malocclusion and dental caries among adolescents in Peshawar. The findings highlight the importance of early orthodontic assessment, enhanced oral hygiene education, and integration of preventive strategies in public health programs to mitigate the growing burden of oral diseases in adolescents.

**INTRODUCTION**

Malocclusion is defined as dentofacial deformity, which includes deformities of teeth, jaws and craniofacial structures, affecting maxillofacial growth and oral functions. It has been ranked as one of the three major oral diseases in the 21st century by World Health Organization. Malocclusion can be attributed to multiple factors including economic conditions, dietary habits, systemic diseases, and race and ethnic groups. The high prevalence of malocclusion during adolescence is a public health problem with physical and psychosocial implications. In addition to functional and esthetic limitations, quality of life can also be affected. Dental caries and malocclusion represent two of the most prevalent oral health challenges among adolescents worldwide. Dental caries, characterized by the demineralization and cavitation of tooth structure due to microbial metabolic activity, remains one of the most common chronic conditions affecting this age group.

Malocclusion, defined as deviations from normal occlusal relationships either in tooth alignment, jaw position, or dental arch form, not only impacts aesthetics and function, but also complicates oral hygiene routines, thus potentially contributing to the occurrence of caries.

Adolescents constitute a high-risk group for both dental caries and malocclusion, with the former affecting between 34 % and 45 % of youth globally and the latter presenting in over 80 % of adolescents in some populations. Malocclusion and dental caries are two closely interrelated oral health issues affecting adolescents, significantly influencing their oral function, aesthetics, and overall quality of life. Malocclusion, characterized by misalignment of teeth, crowding, spacing, and improper occlusal relationships, can create an environment conducive to plaque accumulation, food impaction, and bacterial colonization, ultimately increasing the risk of dental caries. Poorly aligned teeth often present challenges in maintaining optimal oral hygiene, as certain areas become difficult to clean, leading to increased plaque retention and enamel demineralization. In adolescents, this problem is further compounded by factors such as high sugar consumption, poor oral hygiene practices, and access to dental care, particularly in regions like Peshawar, where socioeconomic disparities and lack of oral health awareness play a significant role in disease progression. Additionally, malocclusion can alter salivary flow dynamics and self-cleansing mechanisms, reducing the natural protective effects of saliva against acid attacks and bacterial proliferation. Adolescents with severe malocclusion may also experience functional difficulties such as improper chewing, which can influence dietary choices and further exacerbate caries risk. Understanding the relationship between malocclusion and dental caries in adolescents visiting a dental teaching hospital in Peshawar is crucial for early identification of high-risk individuals, enabling targeted preventive measures, improved orthodontic and restorative treatment planning, and effective oral health education programs. The findings of such a study can aid in the development of community-based interventions and public health policies to reduce the burden of both malocclusion and dental caries, ultimately improving adolescent oral health outcomes in the region. Various studies from past research papers were done but previous studies have primarily focused on the prevalence epidemiology of malocclusion and dental caries separately, without exploring the relationship. The current study aims to expand the knowledge by focusing on

Malocclusion and Dental caries relationships. Malocclusion is one of the most prevalent dental problems observed in adolescents. It can be defined as an irregularity of teeth or an incorrect relationship of the dental arches that lies beyond the ideal limits. The Malocclusion and Dental Caries is a significant concern in dental public health, as it can lead to occlusal disturbances, bite problems, and compromised oral function. Malocclusion and Dental Caries are two common oral health problems that can have significant impacts on the quality of life of individuals. Despite advancements in preventive dentistry, Malocclusion and Dental Caries occurs due to various causes. However, there is lack of comprehensive data on the frequency and causes of malocclusion and Dental caries, particularly in Peshawar. This knowledge gap hinders the development of targeted intervention to prevent malocclusion and dental caries and promote optimal oral health.

### Research objective

To evaluate the relationship between dental caries and malocclusion in adolescence visiting in dental teaching hospital Peshawar.

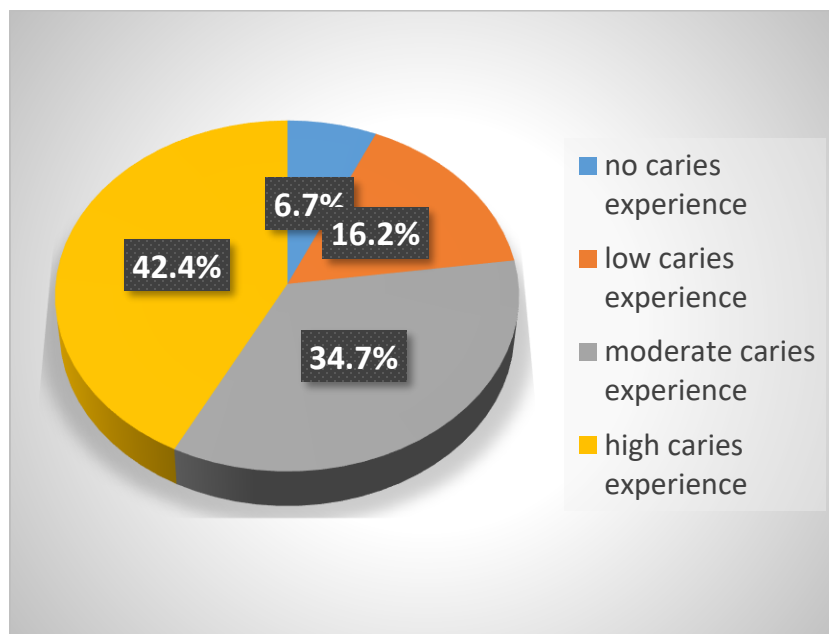
### Research Methodology

This is retrospective cross-sectional study was conducted among adolescents receiving orthodontic treatment at the Orthodontic Ward of Sardar Begum Dental Hospital, Peshawar. All male and female patients aged 10–19 years, presenting with permanent dentition from the right first molar to the left first molar in both arches, whose records are available in orthodontic ward. Data of a total 495 male and female patients aged between 10 to 19 years are collected from hospital records. Incomplete patient records are excluded from the study. Data is collected through a questionnaire which included demographics of the participants, 10 questions related to Dental Aesthetic Index (DAI) and 3 questions regarding Decayed Missing and Filled Teeth (DMFTs). After obtaining ethical approval from the City University of Science and Information Technology, we visited Sardar Begum Dental Hospital and received ethical approval from them as well to conduct our research and obtain secondary data from the hospital records. Mean, standard deviation, and frequency distributions will summarize malocclusion severity and caries prevalence. Chi-square

tests for categorical variables (e.g., presence vs. absence of caries across malocclusion categories). ANOVA or Kruskal Wallis for comparing mean DMFT scores across multiple DAI categories. Findings will be displayed using tables and graphs, with statistical significance.

### Results and Analysis

After obtaining ethical approval from city university of science and information technology we visited Sardar Begum Dental hospital and obtained ethical approval from them as well to conduct research in their hospital. After approvals secondary data was collected from 495 patients available records in hospital through a structured questionnaire. The following are the results and analysis of our study. The survey included 495 respondents, and the survey was conducted through questionnaire. In this study male were predominantly more (53.5%) and females were (46.5%). The population progressively increased from the age of 10 (0.4%) to age 17 (16.4%), then decreased slightly through age 19 (11.3%), according to the age distribution. With considerable gains from age 11 (5.1%) to age 14 (11.5%), early adolescence experiences constant development. The late teenagers have the highest concentration, especially those between the ages of 16 and 17, showing that the population has a tendency toward older teenagers. According to the data about malocclusion severity, the majority of people 57.6% have very severe malocclusion, which shows that there is a major orthodontic care in the overall population. 8.1% of the population have definite malocclusion, while 13.1% of individuals fall into the severe malocclusion category. Just 21.2% of the population have normal or minor malocclusion.



**Figure 1 DMF score**

According to data analysis from the DMF (decayed, missing, and filled teeth) score, most people have a certain amount of dental caries. With 42.4% having a high caries experience and 34.7% having a moderate caries experience, it is clear that more than three-quarters of people have noticeable dental decay. Just 6.7% have no caries history, compared to 16.2% with a little caries experience. This shows that a very tiny percentage of the population has teeth that are in perfect health. According to the data, there is a significant gender difference in the degree of malocclusion ( $p = 0.001$ ). The percentage of very severe malocclusion was higher in males (62.6%) compared to normal or moderate cases in females (28.7%). According to this, men are more susceptible than women to suffering from acute malocclusion. The caries experiences of 495 individuals are detailed in the statistics categorized by gender. Among males ( $n=265$ ), the highest number had significant caries experience (119), with moderate experiences following (98), then low (33), and finally, those with no caries experience (15). Similarly, the greatest number of females ( $n=230$ ) fell into the high caries group (91), while moderate experiences were next (74), followed by low (47), and those with no caries experience (18). Although there are slightly more females in the low

and no caries categories compared to males, the p-value of 0.061 suggests that there is no statistically significant difference in caries experience between genders.

**Table 1 Age malocclusion severity**

	Normal or minor malocclusion	Definite malocclusion	Severe malocclusion	Very severe malocclusion	Total	P value*
10	0	0	0	2	2	0.316
11	10	0	3	12	25	
12	6	5	7	23	41	
13	13	4	15	23	55	
14	15	2	5	34	56	
15	8	4	6	28	46	
16	13	4	7	41	65	
17	22	7	12	40	81	
18	10	9	5	43	67	
19	8	5	4	39	56	
Total	105	40	65	285	495	

**\*Anova test applied**

The severity of malocclusion in 495 people at different ages is shown in the table. The majority of cases, particularly those involving adolescents 14 to 18, are categorized as extremely severe. While definitive and severe cases change with age, normal or minor malocclusion is often consistent. Age and malocclusion severity do not, however, significantly correlate, as indicated by the p-value of 0.316.

The distribution of dental caries experiences among ages in a sample of 495 participants appears in the table.

Caries experience can be categorized into four categories: no caries, mild, moderate, and high. Moderate and high caries experience are the most common across all age groups, with high caries experience being more common in older age groups like 16 to 19. There are typically fewer people with no or little caries exposure at younger ages. A p value of 0.440 indicates that, although some variation in the number of cases across categories and ages, the overall relationship between age and caries experience is not statistically significant.

**Table 2 Dmf score\* malocclusion severity crosstabulation**

	Normal or minor malocclusion	Definite malocclusion	Severe malocclusion	Very severe malocclusion	P value*
No caries experience	18	4	6	5	0.000
Low caries experience	40	7	15	18	
Moderate caries experience	41	21	25	85	
High caries experience	6	8	19	177	
Total	105	40	65	285	

\*Anova test applied

## Discussion

This study was conducted with the primary objective of evaluating the relationship between malocclusion and dental caries among adolescents visiting the orthodontic ward of Sardar Begum Dental Hospital, Peshawar. The study population comprised 495 adolescents aged 10 to 19 years, and the study utilized structured questionnaires to assess malocclusion via the Dental Aesthetic Index (DAI) and dental caries through the Decayed, Missing, and Filled Teeth (DMFT) index. The findings revealed a strikingly high prevalence of both very severe malocclusion and significant caries experience among the study participants, emphasizing an urgent need for targeted preventive and treatment strategies.

From a demographic perspective, a slightly higher representation of male participants (53.5%) was noted compared to females (46.5%), and a large majority of the respondents were urban residents (77%). The age distribution skewed toward older adolescents, particularly those aged 16 and 17, who together represented a substantial portion of the study sample. This demographic pattern may reflect increased health-seeking behavior in late adolescence or greater awareness of orthodontic issues in older teens. Importantly, the urban-centric nature of the sample may limit the generalizability of the findings to rural populations, which often experience different oral health dynamics due to disparities in access to care and health education.

One of the most critical findings of this study is the statistically significant association between malocclusion severity and dental caries experience ( $p < 0.001$ ). This finding corroborates existing literature and confirms the hypothesis that malocclusion can act as an independent risk factor for the development and progression of dental caries. The anatomical configuration of severely malaligned teeth can impede effective plaque removal, create stagnation areas for food particles, and promote the colonization of cariogenic microorganisms such as *Streptococcus mutans*. Several international studies have emphasized this linkage. Sá-Pinto et al. (2021), through a meta-analysis of multiple cross-sectional studies, established a clear dose-response relationship between increasing DAI scores and higher DMFT values. Similarly, Singh and Purohit (2021) confirmed

that “handicapping” and “severe” malocclusions were significantly associated with elevated caries scores among children and adolescents.

The current study also examined the influence of gender and age on both malocclusion and caries experience. Although a higher percentage of males exhibited very severe malocclusion (62.6%), gender differences in caries experience were not statistically significant ( $p = 0.061$ ). This is consistent with the observations of Patil et al. (2023), who reported that although the distribution of malocclusion patterns may differ slightly between genders, caries prevalence is often influenced more by behavioral and dietary habits than by biological sex. Likewise, the association between age and caries severity in the present study was statistically insignificant ( $p = 0.440$ ), suggesting that caries progression may plateau or fluctuate in adolescence based on other modifying factors such as oral hygiene behavior, dietary intake, fluoride exposure, and access to professional care.

## Conclusion

This study demonstrates a clear and statistically significant relationship between malocclusion and dental caries among adolescents attending a dental teaching hospital in Peshawar. The high prevalence of very severe malocclusion (57.6%) and moderate to high caries experience (77.1%) underscores the dual burden of these oral health issues. Adolescents with more severe malocclusion exhibited higher DMFT scores, indicating compromised oral hygiene due to anatomical and functional barriers posed by misaligned teeth. These findings reinforce global evidence that malocclusion is not merely an aesthetic concern but a significant risk factor for dental disease. Integrating early orthodontic assessments into routine adolescent dental care and implementing school-based oral health programs can help reduce long-term oral morbidity.

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