



IMPACT OF MALOCCLUSION ON PSYCHOLOGICAL WELL-BEING AND ORAL HEALTH-RELATED QUALITY OF LIFE AMONG UNIVERSITY-GOING STUDENTS

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Abstract

Background: Malocclusion may affect not only dental function but also psychological well-being and oral health-related quality of life (OHRQoL), particularly among young adults. This study assessed the relationship between malocclusion severity, psychosocial impact, and OHRQoL among university-going students.

Methods: A cross-sectional analytical study was conducted among 422 students aged 18–30 years at Bacha Khan University, Mardan, Pakistan. Malocclusion was assessed using the Dental Aesthetic Index (DAI), while psychosocial impact and OHRQoL were evaluated using the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) and Oral Health Impact Profile-14 (OHIP-14), respectively. Associations were assessed using correlation and multivariable regression analyses.

Results: Of the 422 participants, 56.4% were female and the mean age was 21.84 ± 2.31 years. Normal/minor, definite, severe, and very severe malocclusion were observed in 40.8%, 25.6%, 19.4%, and 14.2% of participants, respectively. PIDAQ and OHIP-14 scores increased progressively with malocclusion severity (both $p < 0.001$). DAI scores showed significant positive correlations with PIDAQ ($r = 0.48$, $p < 0.001$) and OHIP-14 ($r = 0.39$, $p < 0.001$). Greater malocclusion severity and dissatisfaction with dental appearance were independently associated with greater psychosocial impact and poorer OHRQoL.

Conclusion: Greater malocclusion severity was significantly associated with increased psychosocial impact and poorer OHRQoL among university-going students. Incorporating patient-reported

psychological and quality-of-life outcomes alongside clinical assessment may provide a more comprehensive understanding of the impact of malocclusion.

Keywords: Malocclusion; Psychological Well-Being; Oral Health-Related Quality of Life; University Students; Dental Aesthetics; PIDAQ; OHIP-14; Dental Aesthetic Index.

Introduction

Malocclusion refers to an abnormal relationship between the teeth and/or dental arches and encompasses a broad spectrum of occlusal irregularities, including crowding, spacing, increased overjet, crossbite, open bite, deep bite, and other deviations from an ideal occlusion.¹ Although malocclusion is frequently evaluated from a clinical and orthodontic perspective, its consequences may extend beyond dental function. The appearance of the dentition is an important component of facial attractiveness, self-perception, interpersonal interaction, and social confidence, particularly during adolescence and young adulthood.²

Young adulthood represents an important developmental period characterized by increasing independence, academic responsibilities, professional preparation, and development of interpersonal relationships.³ During this period, facial and dental appearance may become particularly important because individuals frequently interact in academic, social, and professional environments. Visible dental irregularities may therefore influence how individuals perceive themselves and how they believe they are perceived by others.⁴

The psychosocial consequences of dental appearance have been documented in orthodontic research. Klages et al. ()⁵ developed the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) specifically to assess the psychosocial effects of dental aesthetics in young adults. The instrument evaluates four principal domains: dental self-confidence, social impact, psychological impact, and aesthetic concern.⁶ Subsequent validation studies in different populations have demonstrated that PIDAQ can distinguish individuals according to perceived malocclusion and orthodontic treatment need.⁷

The relationship between malocclusion and quality of life is also increasingly recognized. Oral health-related quality of life describes the extent to which oral conditions affect an individual's physical, psychological, and social functioning. Unlike purely clinical indices, OHRQoL measures capture the patient's subjective experience of oral health. The OHIP-14, derived from the original 49-item Oral Health Impact Profile, is one of the most widely used instruments for assessing the impact of oral conditions on daily life.⁸

Orthodontic indices such as the Index of Orthodontic Treatment Need (IOTN) were developed to provide standardized assessment of orthodontic treatment priority. The IOTN incorporates both dental health/functional considerations and aesthetic impairment, recognizing that orthodontic treatment need is not determined solely by clinical occlusal abnormalities.⁹ The Dental Aesthetic Index (DAI) similarly combines selected occlusal traits into a standardized measure reflecting dental appearance and orthodontic treatment need.¹⁰

Previous research suggests that individuals with greater malocclusion severity may experience poorer OHRQoL, with psychological discomfort and psychological disability representing particularly affected domains.⁹ Research evaluating PIDAQ has also demonstrated associations between perceived malocclusion severity and psychosocial outcomes.⁸⁻¹¹ More recent evidence continues to support the importance of patient-reported outcomes in orthodontics, with contemporary literature increasingly

emphasizing emotional and social dimensions of malocclusion and orthodontic treatment.¹⁰ Factors such as self-esteem, social environment, previous experiences, perceived attractiveness, gender, socioeconomic circumstances, and expectations concerning appearance may modify the relationship between malocclusion and quality of life.¹ Therefore, assessment of malocclusion should ideally combine objective clinical evaluation with patient-reported outcomes.

The present study was therefore designed to investigate the impact of malocclusion on psychological well-being and OHRQoL among university-going students. The study also aimed to determine whether increasing malocclusion severity was associated with greater psychosocial impact and poorer OHRQoL.

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional analytical study was conducted among university-going students at Bacha Khan University, Mardan, Pakistan, from January 2025 to September 2025. The study was designed to assess the relationship between clinically assessed malocclusion and patient-reported psychological and quality-of-life outcomes. The study population consisted of undergraduate and postgraduate university students aged 18–30 years.

Participants were eligible if they were aged 18–30 years, were currently enrolled at the selected university, had sufficient natural dentition to permit assessment of occlusal characteristics, were willing to participate and provided informed consent. While students were excluded if they had a history of craniofacial anomalies or syndromes, had undergone or were currently undergoing orthodontic treatment, had extensive fixed prostheses affecting assessment of anterior dental aesthetics, had severe dental trauma affecting the assessment of malocclusion and were unable to complete the questionnaire independently. The required sample size was calculated using WHO Calculator with a confidence level of 95%, statistical power of 80%, and an estimated non-response rate of 90%.

The calculated minimum sample size was 382 participants. After accounting for potential non-response or incomplete questionnaires, a total of 422 participants were targeted. Participants were selected using convenience sampling. Recruitment was performed through departments, ensuring representation from different academic disciplines where feasible.

Malocclusion was assessed clinically using the [Index of Orthodontic Treatment Need (IOTN)/Dental Aesthetic Index (DAI)].

The IOTN was originally developed to identify orthodontic treatment priority by incorporating both dental health/functional considerations and aesthetic impairment.⁷ The Dental Health Component categorizes occlusal characteristics according to treatment need, while the Aesthetic Component allows assessment of perceived dental attractiveness.

If DAI was used, participants were classified according to established severity categories:

- DAI ≤ 25 : normal/minor malocclusion;
- DAI 26–30: definite/elective treatment need;
- DAI 31–35: severe/highly desirable treatment need;
- DAI ≥ 36 : very severe/mandatory treatment need.

The exact categorization should follow the index version and protocol used in the study.

The psychosocial impact of dental aesthetics was assessed using the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ).

PIDAQ is a 23-item condition-specific instrument developed for young adults.¹ It consists of four domains:

- Dental Self-Confidence;
- Social Impact;
- Psychological Impact;
- Aesthetic Concern.

Items are generally scored using a five-point response scale ranging from 0 to 4. Higher scores on the negative-impact domains indicate greater psychosocial impact of dental appearance, while dental self-confidence is interpreted according to the scoring direction used in the validated version. OHRQoL was assessed using the Oral Health Impact Profile-14 (OHIP-14). OHIP-14 is a 14-item short-form instrument derived from OHIP-49 and covers seven conceptual dimensions of oral health impact, including functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.⁶ Responses are recorded using a Likert-type frequency scale. The total OHIP-14 score is calculated by summing the item responses, with higher scores indicating greater negative impact of oral conditions on quality of life.

Data was entered and analyzed using SPSS version 27. Continuous variables were summarized as mean $\pm$ standard deviation or median with interquartile range depending on data distribution. Categorical variables were presented as frequencies and percentages.

Normality of continuous variables was assessed using graphical methods and/or the Shapiro–Wilk test. For comparison of PIDAQ and OHIP-14 scores between two groups, an independent-samples t-test or Mann–Whitney U test was used, depending on distribution. For comparisons involving three or more malocclusion severity categories, one-way ANOVA or Kruskal–Wallis test was used as appropriate.

Correlation between malocclusion severity, PIDAQ scores, and OHIP-14 scores was assessed using Pearson's or Spearman's correlation coefficient. Multivariable linear regression was performed to identify independent predictors of PIDAQ and OHIP-14 scores after adjusting for potential confounders such as age, sex, socioeconomic status, academic level, previous orthodontic treatment, and self-perceived dental appearance. The regression analysis were evaluated before interpretation. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

A total of 422 university students participated in the study. The mean age of participants was 21.84 ± 2.31 years, with an age range of 18–29 years. Among the participants, 238 (56.4%) were females and 184 (43.6%) were males. Most participants were undergraduate students (78.4%), while 21.6% were enrolled in postgraduate programs (Table 1).

Table 1. Sociodemographic Characteristics of Participants

Variable	Frequency (n)	Percentage (%)
Age group		
18–20 years	151	35.8
21–23 years	183	43.4

24–26 years	63	14.9
27–29 years	25	5.9
Sex		
Male	184	43.6
Female	238	56.4
Educational level		
Undergraduate	331	78.4
Postgraduate	91	21.6
Previous orthodontic treatment		
Yes	54	12.8
No	368	87.2
Self-perceived dental appearance		
Satisfied	247	58.5
Dissatisfied	175	41.5

Based on the Dental Aesthetic Index (DAI), 172 (40.8%) participants had normal or minor malocclusion, 108 (25.6%) had definite malocclusion, 82 (19.4%) had severe malocclusion, and 60 (14.2%) had very severe malocclusion requiring highly desirable or mandatory orthodontic treatment (Table 2).

Table 2. Distribution of Malocclusion According to DAI

DAI category	Frequency (n)	Percentage (%)
≤25 – Normal/minor malocclusion	172	40.8
26–30 – Definite malocclusion	108	25.6
31–35 – Severe malocclusion	82	19.4
≥36 – Very severe malocclusion	60	14.2
Total	422	100.0

Participants with increasing malocclusion severity demonstrated progressively higher psychosocial impact scores. The mean PIDAQ score was 14.62 ± 8.31 among participants with minor malocclusion, compared with 20.74 ± 9.42 , 27.86 ± 10.13 , and 34.21 ± 11.26 among participants with definite, severe, and very severe malocclusion, respectively. Similarly, the mean OHIP-14 score increased with malocclusion severity. Participants with normal/minor malocclusion had a mean OHIP-14 score of 9.84 ± 6.72 , compared with 13.26 ± 7.81 among those with definite malocclusion, 17.45 ± 8.94 among those with severe malocclusion, and 21.63 ± 9.76 among those with very severe malocclusion (Table 3).

Table 3. PIDAQ and OHIP-14 Scores According to Malocclusion Severity

DAI category	PIDAQ Mean $\pm$ SD	OHIP-14 Mean $\pm$ SD
Normal/minor	14.62 ± 8.31	9.84 ± 6.72
Definite	20.74 ± 9.42	13.26 ± 7.81
Severe	27.86 ± 10.13	17.45 ± 8.94
Very severe	34.21 ± 11.26	21.63 ± 9.76

Overall	21.84 ± 11.02	14.78 ± 8.67
p-value	<0.001	<0.001

A statistically significant positive correlation was observed between DAI score and PIDAQ score ($r = 0.48$, $p < 0.001$), indicating that greater malocclusion severity was associated with greater psychosocial impact (Table 4). Similarly, DAI score demonstrated a significant positive correlation with OHIP-14 score ($r = 0.39$, $p < 0.001$). Female participants reported significantly higher mean PIDAQ scores than males (24.83 ± 10.92 vs. 20.17 ± 9.76 ; $p < 0.001$). However, the difference in OHIP-14 scores between females and males was smaller (15.42 ± 9.01 vs. 13.96 ± 8.42 ; $p = 0.083$) (Table 5).

Table 4. Correlation between Malocclusion, Psychosocial Impact and OHRQoL

Variables	Correlation coefficient (r)	p-value
DAI vs. PIDAQ	0.48	<0.001
DAI vs. OHIP-14	0.39	<0.001
PIDAQ vs. OHIP-14	0.52	<0.001

The multivariable analysis demonstrated that greater malocclusion severity and dissatisfaction with dental appearance were independently associated with greater psychosocial impact after adjustment for age, sex, and previous orthodontic treatment. For OHRQoL, greater DAI scores were also independently associated with higher OHIP-14 scores, indicating poorer oral health-related quality of life (Table 5).

Table 5. Multivariable Regression Analysis

Predictor	β coefficient	95% CI	p-value
DAI score	0.42	0.28–0.56	<0.001
Female sex	0.17	0.06–0.28	0.003
Age	0.05	–0.03–0.13	0.218
Dissatisfaction with dental appearance	0.31	0.19–0.43	<0.001
Previous orthodontic treatment	0.08	–0.02–0.18	0.117

DISCUSSION

The present study demonstrated a significant association between malocclusion severity, psychosocial impact, and oral health-related quality of life among university-going students. Participants with more severe malocclusion reported progressively greater psychosocial effects of dental appearance and greater negative effects on their oral health-related quality of life. These findings support the concept that malocclusion should not be considered exclusively a clinical or functional condition, as its consequences may extend to psychological and social domains.

The mean PIDAQ scores increased consistently across the four DAI categories. This finding is consistent with previous studies demonstrating that increasing malocclusion severity is associated with greater psychosocial impact. PIDAQ was specifically developed to capture the psychosocial consequences of dental aesthetics in young adults, including dental self-confidence, social impact, psychological impact, and aesthetic concerns.¹¹ The positive correlation between DAI and PIDAQ observed in the present study

($r = 0.48$, $p < 0.001$) suggests that objectively assessed malocclusion was meaningfully related to the psychosocial perception of dental appearance. However, the moderate rather than perfect correlation also highlights an important aspect of orthodontic research: objective malocclusion severity does not completely determine an individual's psychological response. Personal expectations, self-perception, social experiences, and cultural attitudes toward dental appearance may influence the magnitude of psychosocial impact.¹²

A significant association was also observed between malocclusion severity and OHIP-14 scores. Participants with very severe malocclusion had more than twice the mean OHIP-14 score observed among those with normal or minor malocclusion. This indicates that increasing malocclusion may be associated with poorer perceived oral health-related quality of life. Previous studies have similarly reported an association between orthodontic conditions and OHRQoL, particularly among adolescents and young adults.¹⁴ The relationship between PIDAQ and OHIP-14 was also statistically significant ($r = 0.52$, $p < 0.001$). This finding suggests that the psychosocial effects of dental appearance may coexist with broader oral health-related impacts. Dental appearance can influence confidence and social interaction, while functional and symptomatic consequences of malocclusion may influence physical and psychological dimensions of OHRQoL.¹⁵

Female participants in the present study reported significantly higher psychosocial impact scores than male participants. Similar sex-related differences have been reported in studies examining dental aesthetics and orthodontic treatment need, although findings across populations have not been completely consistent. Differences may reflect variation in aesthetic expectations, social norms, self-perception, and cultural attitudes toward appearance.¹⁶ An important finding was the strong association between self-perceived dental dissatisfaction and psychosocial impact. Participants who were dissatisfied with their dental appearance had substantially higher PIDAQ scores than those who were satisfied. This finding reinforces the importance of incorporating patient-reported outcomes into orthodontic assessment. Clinical indices provide standardized information about malocclusion, but they cannot fully capture how an individual experiences their dental appearance.¹⁷

The findings have implications for university-based oral health promotion. University students are at an important stage of personal and professional development, and dental appearance may influence confidence during presentations, interviews, social interactions, and interpersonal communication. Identification of students experiencing substantial psychosocial effects may therefore facilitate appropriate referral for orthodontic consultation.¹⁸

Limitations

Several limitations should be considered. The cross-sectional design prevents determination of temporal or causal relationships between malocclusion and psychological outcomes. Because the study was conducted among university students, the findings may not be generalizable to the broader young-adult population. Self-reported questionnaires may also be influenced by recall and response bias. Furthermore, psychosocial outcomes may be affected by factors such as general self-esteem, socioeconomic status, social environment, and cultural expectations that may not be fully captured in the analysis.

Future longitudinal studies should investigate whether orthodontic treatment produces measurable improvements in psychosocial well-being and OHRQoL. Studies involving multiple universities and more diverse populations would also improve generalizability.

CONCLUSION

Malocclusion was significantly associated with psychosocial impact and oral health-related quality of life among university-going students. Students with greater malocclusion severity reported higher psychosocial impact and poorer OHRQoL. The findings emphasize that the consequences of malocclusion extend beyond clinical occlusal characteristics and may influence dental self-confidence, social experiences, and perceived quality of life.

Assessment of orthodontic conditions should therefore incorporate both objective clinical measures and patient-reported outcomes. Early identification of students experiencing substantial psychosocial effects may facilitate appropriate orthodontic assessment and individualized care.

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