



Relationship Between Orthodontic Treatment Need, Dental Caries Experience, and Oral Health-Related Quality of Life Among Patients Seeking Dental Care: A Cross-Sectional Analytical Study

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Abstract: Objective: To assess the association among orthodontic treatment need, dental caries experience and oral health-related quality of life among dental care seekers. **Methods:** An analytical cross-sectional study was carried out in Department of Orthodontic, attending to 136 patients. Participants were consecutively recruited. Various dental indices were evaluated by the Oral Health Impact Profile-14 (OHIP-14). Data was analyzed by SPSS version 27 and a p-value <0.05 was considered statistically significant. **Results:** The mean DMFT and OHIP-14 scores were 4.72 ± 2.51 and 18.63 ± 8.92 , respectively. There were significant positive correlations between orthodontic treatment need and OHIP-14 score ($\rho = 0.612$, $p < 0.001$) and DMFT score ($\rho = 0.354$, $p < 0.001$). The number of orthodontic treatment needs was significantly higher with higher DMFT and OHIP-14 scores ($p < 0.001$). **Conclusions:** A higher need for orthodontic treatment and higher dental caries experience were both significantly associated with impaired OHQoL, thereby emphasizing the need for integrated preventive and orthodontic care to enhance patient-centered oral health outcomes.

Keywords: Orthodontic treatment need; Dental caries; DMFT; Oral health-related quality of life; OHIP-14; Malocclusion; Cross-sectional study.

INTRODUCTION

Oral health disorders such as malocclusion, dental caries, and oral health-related quality of life (OHRQoL) are among the most common oral health disorders worldwide and a significant public health burden.[1][2] Malocclusion is the third most frequently reported oral disorder following dental caries and periodontal disease, and has been reported to occur in between 39% and 93% of different populations.[3] These conditions have additional implications beyond their functional deficits, such as an impact on appearance, social functioning, and quality of life.

Patients coming to the dentist may have varying levels of orthodontic treatment need and dental caries experience, which can influence, or both.[4] The Index of 'Orthodontic Treatment Need' (IOTN) is a commonly used index to assess orthodontic treatment need, while the 'Decayed, Missing, and Filled Teeth' (DMFT) index is used to assess dental caries experience.[5, 6]

OHRQoL is a patient-centred measure of the functional, psychological and social impacts of oral diseases and is typically measured using an established instrument, like the 'Oral Health Impact Profile' (OHIP-14).[7] Previous studies have examined the relationship between need for orthodontic treatment and OHRQoL or between dental caries experience and OHRQoL.[8] A knowledge of these interrelationships is necessary to recognize those patients who require a more intensive treatment program and to prioritize the need for comprehensive patient-centred oral care.[9]

Hence, the objective of this study was to find out the relationship between orthodontic treatment needs, dental caries experience and OHRQoL among individuals attending dental services. The results could serve as evidence for implementing integrated preventive and therapeutic strategies, help identify subjects who are at risk of developing poor oral health outcomes at an early stage, and support clinical decision-making and resource allocation in routine dental practice.

METHODOLOGY

This is an analytical cross-sectional study carried out in the Department of Orthodontic . During the study period, patients who visited the outpatient dental clinics for routine dental checkups or orthodontic consultations were recruited. This study was carried out for six months Jan to July, 2025.

A sample size was calculated using OpenEpi software

Version 3.01, with a correlation coefficient between IOTN and OHRQoL of approximately 0.25.[10] At a 95% confidence level, 80% power, and a two-sided significance level of 5%, the minimum sample size was calculated as 123 participants. To compensate for missing information in some questionnaires and potential nonresponse, 10% was added, resulting in 136 respondents.

A non-probability sampling technique was used: consecutive sampling. Patients who attended the orthodontic and general dental outpatient clinics within the study period and met the inclusion criteria and gave their informed consent were recruited consecutively until the sample size was reached.

All patients older than 18 years who went to the dental outpatient clinics for dental and orthodontic reasons were included in the study. Participants with permanent dentition, who could self-administer the questionnaire OHIP-14 and were able to be clinically examined with little or no aid, were selected after obtaining written informed consent.[11]

Patients on orthodontic treatment and those who had completed orthodontic treatment were excluded. Other patients excluded were those with craniofacial anomalies (e.g., cleft lip and palate), severe systemic conditions that affect oral health, cognitive and/or psychiatric disease conditions that make questionnaire completion difficult, edentulous patients, pregnant women with pregnancy-associated oral changes, and patients with acute pain or trauma requiring emergency dental care.

Eligible patients were approached after getting approval from the Institutional Ethical Review Committee and were given information regarding the objectives of the study. Written informed consent was obtained before enrolment. A structured proforma was used to collect sociodemographic data, such as age, gender, education, and work.

All participants were clinically assessed under standard infection control measures and adequate illumination with a WHO periodontal probe and mouth mirror by a calibrated examiner under a standard clinical oral examination protocol. The 'Dental Health Component' (DHC) of the IOTN was used to estimate orthodontic treatment need.[12] The dental caries experience was assessed by the Decayed, Missing, and Filled Teeth (DMFT) Index following WHO criteria.[13] Oral health-related quality of life was measured by the validated OHIP-14 questionnaire. [14] The completed questionnaires and clinical findings were checked for completeness before being entered into the study database.

All the gathered data were entered and analysed by IBM Statistical Package for the Social Sciences (SPSS) version 27.0. After checking the normality of the Continuous variables (age, DMFT score, IOTN score and OHIP-14 score), the results were presented as mean $\pm$ SD. The frequencies and percentages of the categorical variables like gender, educational status, occupation, and categories of orthodontic treatment need were presented.

The relationship between the need for orthodontic treatment, dental caries experience, and oral health-related quality of life was determined using Pearson's

correlation coefficient when the variables were normally distributed and Spearman's rank correlation coefficient when the variables were not. The "Independent sample t-test," One-way Analysis of Variance (ANOVA), and Mann-Whitney U test were used to examine the variations in the mean OHIP-14 and mean DMFT scores across various orthodontic treatment categories. After adjusting for age, gender, education, and dental caries experience, multiple linear regression was used to find independent characteristics linked to oral health-related quality of life. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 136 patients participated in the study. Participants' mean age was 28.9 years $\pm$ 8.4 years, most of them aged between 18 and 25 (39.7%). 57.4% of the study population were females. The majority of the participants were graduates (41.9%) and employed (43.4%). (Table 1)

In terms of clinical features, 38.2% of the subjects had definite orthodontic treatment need (IOTN Grade 4-5) and 33.1% of the subjects had borderline orthodontic treatment need. The mean DMFT score was 4.72 ± 2.51 , and the mean OHIP-14 score was 18.63 ± 8.92 . Both DMFT and OHIP-14 were assessed for normality and it was found that they were not normally distributed. (Table 2)

There was a significant positive correlation between orthodontic treatment need and OHIP-14 score ($\rho = 0.612$, $p < 0.001$). The dental caries experience was also positively associated with the OHIP-14 score ($\rho = 0.471$, $p < 0.001$). Besides, there was a moderate positive correlation between orthodontic treatment need and DMFT score ($p < 0.001$). (Table 3)

The mean DMFT and OHIP-14 scores were significantly higher for participants with higher orthodontic treatment needs. The mean DMFT score was 3.2 ± 1.8 in the little or no treatment need group and 6.0 ± 2.6 in the definite treatment need group. The mean OHIP-14 score was also found to be significantly higher across IOTN categories ($p < 0.001$ for both comparisons). No differences between demographic (DMFT) or functional (OHIP-14) scores were seen for males and females. (Tables 4 and 5)

After controlling for age, gender, and educational level, multiple linear regression analysis revealed that orthodontic treatment need ($p < 0.001$) and DMFT score ($p < 0.001$) were the independent predictors of poorer oral health-related quality of life. The regression model explained 54.1% of the variance in OHIP-14 scores ($p < 0.001$). (Table 6).

Table 1. Sociodemographic Characteristics of the Study Participants (n = 136)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18-25	54	39.7
26-35	46	33.8
36-45	24	17.6
>45	12	8.8
Mean age (years)	28.9 $\pm$ 8.4	
Gender		
Male	58	42.6
Female	78	57.4
Educational Status		
Primary	18	13.2
Secondary	35	25.7
Graduate	57	41.9
Postgraduate	26	19.1
Occupation		
Student	42	30.9
Employed	59	43.4

Unemployed	21	15.4
Homemaker	14	10.3

Table 2. Clinical Characteristics and Normality Assessment of the Study Variables (n = 136)

Variable	n(%) / Mean $\pm$ SD
IOTN Grade	
Grade 1-2	39 (28.7)
Grade 3	45 (33.1)
Grade 4-5	52 (38.2)
DMFT Score	4.72 $\pm$ 2.51
DMFT Category	
0-3	49 (36.0)
4-6	55 (40.4)
>6	32 (23.5)
OHIP-14 Score	18.63 $\pm$ 8.92
OHIP-14 Category	
Mild	31 (22.8)
Moderate	61 (44.9)
Severe	44 (32.4)

Table 3. Correlation between Orthodontic Treatment Need, Dental Caries Experience and Oral Health-Related Quality of Life

Variables Compared	Correlation Coefficient (ρ)	p-value
IOTN Grade vs OHIP-14 Score	0.612	<0.001
DMFT Score vs OHIP-14 Score	0.471	<0.001
IOTN Grade vs DMFT Score	0.354	<0.001

Table 4. Comparison of Mean DMFT and OHIP-14 Scores Across Orthodontic Treatment Need Categories

IOTN Grade	DMFT Mean $\pm$ SD	OHIP-14 Mean $\pm$ SD
Grade 1-2	3.2 $\pm$ 1.8	11.8 $\pm$ 5.2
Grade 3	4.5 $\pm$ 2.0	18.7 $\pm$ 6.4
Grade 4-5	6.0 $\pm$ 2.6	25.3 $\pm$ 7.1
p-value	<0.001	<0.001

Table 5. Comparison of DMFT and OHIP-14 Scores According to Gender

Variable	Male	Female	p-value
DMFT Score, Median (IQR)	4 (3-6)	5 (3-7)	0.214
OHIP-14 Score, Mean $\pm$ SD	17.2 $\pm$ 8.1	19.7 $\pm$ 9.3	0.098

Table 6. Multiple Linear Regression Analysis for Predictors of Oral Health-Related Quality of Life

Predictor	β	Standard Error	Standardized β	p-value
Age	0.071	0.041	0.096	0.082
Female Gender	1.154	0.863	0.081	0.184
Graduate/Postgraduate Education	-0.894	0.801	-0.072	0.266
DMFT Score	1.026	0.173	0.392	<0.001
IOTN Grade	3.814	0.502	0.548	<0.001
Model statistics: $R^2 = 0.541$; Adjusted $R^2 = 0.523$; $F = 30.68$; $p < 0.001$.				

DISCUSSION

The results of the present study showed that a higher

orthodontic treatment need was significantly related to higher DMFT scores and decreased OHRQoL. Second, a lower OHRQoL was predicted by orthodontic treatment need and dental caries

experience, after adjustment for potential confounding variables. The results indicated that both malocclusion and dental disease combined affect the patients' functional, psychological, and social health.

In the current investigation, there were 38.2% with definite orthodontic treatment need. The prevalence rate did not differ significantly between our results and those reported by Pereira et al. (2021), who found a high percentage of patients that needed orthodontic intervention among those seeking orthodontic treatment.[15] Further, Bekes et al. (2023) concluded that clinically significant orthodontic treatment need was prevalent in the study population, which has led to increased need for orthodontic services.[4]

In our study, the mean DMFT score was found to be 4.72 ± 2.51 , which was a moderate burden of dental caries among the subjects. This result is compatible with several recent studies that found that those who sought orthodontic consultation had a greater caries experience, and that those who did not go to the dentist regularly or had poor oral hygiene had higher DMFT scores. Similarly, research across various populations has shown that untreated dental caries is a significant problem in young adults receiving comprehensive dental care and can impact treatment outcomes and patient satisfaction.[15]

In our study, participants with a higher IOTN had significantly worse OHQoL as evidenced by the OHIP-14 scores, which were progressively higher in the IOTN categories. The results are consistent with Pereira et al. (2021), who found a higher prevalence of poor OHRQoL in patients needing orthodontic treatment, but a greater impact on OHRQoL for tooth loss was found in their regression model.[11] Similarly, Bekes et al. (2023) showed that there was increased impairment in OHRQoL among children when the need for orthodontic treatment increased.[4]

In the present study, the orthodontic treatment need was significantly associated with the OHIP-14 score, as a strong positive correlation was noted ($p = 0.612$). This is also what was found in the recent multicenter cohort study by Keß et al. (2026), which reported that higher orthodontic treatment need and certain anterior malocclusions significantly negatively affected multiple domains of OHRQoL. Similarly, a cross-sectional study of adults with less severe malocclusion in 2024 assessed OHRQoL and noted that patients with higher levels of subjective OOTN had significantly poorer OHRQoL, even with relatively mild clinical malocclusion, emphasising the need to consider patient perception as well as clinical assessment.[16]

The current study also revealed a strong positive

correlation between the dental caries experience and the OHRQoL. Patients with higher DMFT had significantly poorer OHIP-14 scores, indicating that untreated caries significantly affects functional impairments, pain, and psychological discomfort. The findings are also in line with recent studies that found that higher caries experience was associated with poorer eating ability, social function, and oral health perception, leading to poorer quality of life.[17, 18]

Another interesting result of our study was the moderate positive correlation between the need for orthodontic treatment and the DMFT score. The presence of greater malocclusion was associated with greater caries experience, perhaps because of the buildup of plaque as a result of dental crowding and oral hygiene problems. These associations have also been reported in recent studies, indicating that extreme malocclusion may be associated with increased caries risk and underscoring the importance of providing comprehensive preventive and orthodontic services.[19, 20] .

In our study, there were no statistically significant differences in OHIP-14 or DMFT scores between males and females. Similar results have been noted in other recent studies in which gender was not found to be a separate factor influencing the development of OHRQoL. when calculated independently of clinical factors. Conversely, Pereira et al. (2021) found better OHRQoL for men than for females, showing that there are population, psychosocial, and cultural differences that could explain the varied results across studies.

Multiple linear regression analysis showed that the need for orthodontic treatment and DMFT score were independent factors that affected poorer OHRQoL, while age, gender, and educational status did not significantly influence the oral health-related quality of life. These results corroborate the study of Pereira et al. (2021), who used multivariable regression and had similar findings that objective oral health conditions accounted for much of the variance in OHRQoL.[15] In a similar way, Keß et al. (2026) found that the orthodontic treatment need was an independent factor for several QoL domains after adjusting for confounding factors.[21]

In general, the results of the present study are consistent with the increasing evidence that shows orthodontic treatment need and dental caries are associated, and they can have a substantial impact on the oral health-related quality of life. In our study, we add additional evidence by simultaneously assessing these variables in the same analytical model in dental care seekers. The results reinforce the need for a holistic oral evaluation, timely orthodontic referral,

and preventative caries management to optimize outcomes for patients and enhance their quality of life.

The following are some limitations of this study. First, the cross-sectional design did not allow for establishing a causal relationship between orthodontic treatment need, dental caries experience, and oral health-related quality of life. Second, the study was a non-probability consecutive sampling of a single tertiary care center, and this might restrict the generalizability of the results to the broader population. Thirdly, the measure of oral health-related quality of life was measured by a self-reported instrument, which could have introduced a recall and/or social desirability bias. Lastly, other variables that could affect the oral health-related quality of life, including socioeconomic status, periodontal health, oral hygiene practices, and dietary habits, were not assessed.

CONCLUSION

Among dental care seekers, there was a significant relationship between oral health-related quality of life and orthodontic treatment need or dental caries experience. People who required more orthodontic treatment tended to have higher DMFT scores and more significant OHRQoL impairment. Orthodontic treatment need and dental caries experience were both associated with a reduction in quality of life, independent of each other. The study highlights the need for a thorough oral assessment, early orthodontic assessment, and preventive dental care to ensure better patient-centered results and overall oral health.

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