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# Comparison of Oral Health-related Quality of Life in Treated and Untreated Class II Adolescent Patients

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**Abstract**

**Aim**: This study aimed to investigate the effect of growth modification treatments on oral health-related quality of life in adolescents aged 11 to 14 years with Class II malocclusion.
**Methods**: Eighty people participated in this case-control study. The case group (n=43) included adolescents with a history of Class II malocclusion treated with growth modification treatments. The control group consisted of 37 adolescents with Class II malocclusion who were not treated. Both groups were given a translation of the Child Perception Questionnaire (CPQ), measuring the quality of life in four domains: oral symptoms, functional limitations, psychological health, and social well-being. Data were statistically analyzed by SPSS software and a significance level of 0.05 was considered.
**Results**: The oral health-related quality of life of the case group was better than the control group in all areas although this difference was not statistically significant (P=0.204).
**Conclusion**: The oral health-related quality of life between two groups was not different; however, the difference in mental health components between the two groups was clinically negligible.

**Keywords:** Quality of Life, Malocclusion, Angle Class II, Adolescent, Oral Health

## Background

According to WHO, the definition of health not only refers to the lack of disease but also to possess adequate health physically, psychologically, and socially. Therefore, in a study, all aspects affecting health should be considered (1).

Malocclusion is one of the most prevalent oral and dental problems, and in terms of WHO ranks third in common oral diseases after caries and periodontal diseases (1). Clear malocclusion, increased overjet, and crowded incisors are related to low self-esteem in adolescents (2). Optimal appearance is also one of the factors in improving socio-psychological status (3). The second most important factor in the appearance of the face after the eyes is the mouth and teeth and the overall appearance of the teeth and face affects the mental image of the person (body image) and can help one's satisfaction, and the higher satisfaction of the person with their overall facial structure, would be the higher the confidence (4).

The results of a study have shown that malocclusion severity could negatively impact the quality of life. Considering the psychological effects of malocclusion on quality of life, clinicians should place more emphasis on the treatment of patients with malocclusions (2, 3). Developmental modification treatments should be performed before or during the growth spurt during adolescence because, after this period, skeletal growth has nearly ceased. In class II malocclusion, depending on which jaw has growth defects or overgrowth, treatments are usually divided into two types of functional devices (stimulating mandible growth) and a variety of headgears (preventing maxillary overgrowth) (4). In cases where dental defects or growth spurts have occurred and growth shaving treatments can no longer be used, fixed treatment is chosen (4). However, to choose the appropriate method, all of

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the patient's conditions should be considered and the final treatment plan should be chosen according to the clinical conditions and psychosocial conditions of the patient (4,1). The definition of the oral health-related quality of life (OHRQOL) concept, according to the U.S. Public Health Service, is a "structurally multi-dimensional quality of life" and indicates people's ease when eating and sleeping, how much they participate in social interactions, self-esteem, and contentment with their oral health (5).

In class II malocclusion, as mentioned above, there are two main therapeutic pathways. Considerable research has been conducted on the fixed path (6, 7) and a positive correlation exists between fixed treatments and OHRQOL (8). However, oral quality of life in removable aligners is less evident and there is no accurate comparison between these two treatments. According to studies, during fixed orthodontic treatment, especially in the early months, there is a decrease in quality of life, but over time this index improves (9). Due to the lack of investigation of this issue in different studies, this study aimed to investigate the effects of growth modification treatments on oral health-related quality of life in adolescents aged 11 to 14 years with class II malocclusion.

## Methods

Eighty patients participated in this study. The case group was composed of 43 patients between 11 and 14 years old who were treated by class II growth change treatments including functional and headgear devices in the orthodontics department of the Mashhad Dental School and had 1-3 mm overjet and half-face improvement. (The overjet of the case group was greater than or equal to 5 mm before treatment.)

Parallel with this group, the control group consisted of 37 untreated patients with grade II (overjet greater than or equal to 5 mm and convex protrusion), with the same age range of 11 to 14 years and with the same sex dispersion. These subjects were selected from students of Nasim Vahid Girls' School located on Majd Boulevard and patients referred to the orthodontic department of the faculty for which treatment had not yet begun. Both groups were given a 14 CPQ11 questionnaire, wherein the orthodontics department authenticated its validity and reliability (Cronbach's alpha coefficient was 0.894 and ICC was 0.91), and according to the obtained scores, the quality of life-related to the oral health of these adolescents was measured and compared.

To evaluate the distribution of quantitative variables, the Shapiro–Wilk test was used. To investigate the influential variables such as age, overjet, and sex, the Mann-Whitney and chi-square tests were used.

The scores of the domains of the two groups were analyzed and compared using the independent t-tests, and Mann-Whitney odor tests were used. The statistical significance level was set to 5%.

## Results

In this study, the quality of life in the two groups of students was assessed using the CPQ11-14 questionnaire in 2021 in general and partially (in different domains). The total participants were 80 (case group: 43 subjects, control group: 37 subjects), of whom 66.3% were female and 33.7% were male. The mean and standard deviation of age was 11.8±1.7 years and their age range were 11 to 14 years.

Next, we described the scores of all domains and the overall score of the questionnaire and compared the scores obtained in each area and the overall score of the questionnaire in terms of the group. The overall status of the score of each domain and the total score are as follows: The highest and lowest mean domains were related to "oral problems" and "functional limitations", respectively. The lowest and highest total scores were 0 and 77, respectively. The mean and median of the total scores were 25.79 and 23, respectively.

Then the normality of the distribution of age, overjet, and each domain and total score in the studied groups were evaluated using the Shapiro-Wilk test. The results indicated that only the scores of oral problems in both groups had normal distribution, so this content was considered in the data analysis (Table 1).

The variables affecting age, sex, and overjet in the two groups were also compared. In Table 2, the comparison of age and overjet between groups is shown. In Table 3, the frequency distribution of sex in the studied groups is shown. No significant difference existed between the groups regarding confounding variables. In this section, we compared the total score and scores of each domain between the groups.

**Table 1.** Shapiro-Wilk test results for normalization of data distribution of quantitative variables studied

| Variable | | Statistics | Degrees of Freedom | P-value | Distribution |
|---|---|---|---|---|---|
| Age | Case | 0.942 | 43 | 0.032 | Abnormal |
| | Control | 0.918 | 37 | 0.010 | Abnormal |
| Overjet | Case | 0.897 | 43 | 0.001 | Abnormal |
| | Control | 0.833 | 37 | 0.000 | Abnormal |
| Oral Problems | Case | 0.973 | 43 | 0.392 | Normal |
| | Control | 0.942 | 37 | 0.054 | Normal |
| Functional Limitations | Case | 0.882 | 43 | <0.001 | Abnormal |
| | Control | 0.870 | 37 | <0.001 | Abnormal |
| Emotional and Mental Health | Case | 0.838 | 43 | <0.001 | Abnormal |
| | Control | 0.907 | 37 | 0.005 | Abnormal |
| Social Welfare | Case | 0.703 | 43 | <0.001 | Abnormal |
| | Control | 0.807 | 37 | <0.001 | Abnormal |
| Total Score | Case | 0.902 | 43 | 0.001 | Abnormal |
| | Control | 0.905 | 37 | 0.004 | Abnormal |

The score of each domain and the total score of the questionnaire between the groups were compared. In Table 4, the score of each domain and the overall score of the questionnaire between the groups are given. In Table 5, the relationship between age and domains and overall score is given. It can be observed that in the case group, only the domain of "functional constraints" had a direct relationship (P=0.016). Other domains and overall scores indicated no significant association with age.

Furthermore, other domains and total scores were not significantly correlated with overjet. In the control group, none of the domains and total score had a significant relationship with any of the variables of age and overjet.

**Table 2.** Comparison of age and overjet between groups

| Variable | Group | Number | Standard Deviation±Average | Middle | Max | Min | Mann-Whitney U result |
|---|---|---|---|---|---|---|---|
| Age | Case | 43 | 12.4±1.6 | 12.0 (3.0) | 14 | 11 | Z=2.90 |
| | Control | 37 | 11.2±1.7 | 11.0 (3.0) | 14 | 11 | P=0.040 |
| Overjet | Case | 43 | 7.4±2.3 | 7.0 (4.0) | 14 | 5 | Z=0.75 |
| | Control | 37 | 7.1±2.4 | 6.0 (4.0) | 14 | 5 | P=0.452 |

**Table 3.** Frequency distribution of sex in the studied groups

| | | | Sex | | Total |
|---|---|---|---|---|---|
| | | | Female | Male | |
| Group | Case | Number | 31 | 12 | 43 |
| | | % | 72.1% | 72.9% | 100.0% |
| | Control | Number | 22 | 15 | 37 |
| | | % | 59.5% | 40.5% | 100.0% |
| Total | | Number | 53 | 27 | 80 |
| | | % | 66.3% | 33.8% | 100.0% |
| Chi-square result | | | X2=1.42 p=0.233 | | |

**Table 4.** Comparison of scores in each domain and total score between groups

| Area | Group | Number | Standard Deviation±Average | Middle | Most | Least | Mann-Whitney Result |
|---|---|---|---|---|---|---|---|
| Oral Problems | Case | 43 | 7.2±4.2 | 7.0 (6.0) | 16 | 0 | T=1.25 |
| | Control | 37 | 8.5±5.2 | 7.0 (8.0) | 22 | 0 | P=0.216 |
| Functional Limitation | Case | 43 | 4.9±4.6 | 4.0 (6.0) | 18 | 0 | Z=0.07 |
| | Control | 37 | 5.1±5.2 | 4.0 (7.5) | 19 | 0 | P=0.942 |
| Emotional and Mental Health | Case | 43 | 5.2±5.3 | 4.0 (7.0) | 20 | 0 | Z=1.65 |
| | Control | 37 | 7.3±6.2 | 6.0 (8.0) | 26 | 0 | P=0.100 |
| Social Welfare | Case | 43 | 6.1±7.8 | 3.0 (5.0) | 34 | 0 | Z=0.90 |
| | Control | 37 | 7.6±8.2 | 4.0 (9.0) | 30 | 0 | P=0.369 |
| Total Score | Case | 43 | 23.4±16.0 | 21.0 (21.0) | 77 | 0 | Z=1.27 |
| | Control | 37 | 28.5±19.1 | 23.0 (22.0) | 74 | 0 | P=0.204 |

T: Independent Samples t-Test

**Table 5.** The relationship between age and overjet with domains and total score

| Group | Variable | | Oral Problems | Functional Limitation | Emotional and Mental Health | Social Welfare | Total Score |
|---|---|---|---|---|---|---|---|
| Case (43) | Age | Spearman's rank correlation coefficient | 0.151 | 0.367 | 0.099 | 0.065 | 0.21 |
| | | P value | 0.335 | 0.016 | 0.527 | 0.677 | 0.176 |
| | Overjet | Spearman's rank correlation coefficient | 0.115 | 0.173 | 0.088 | 0.169 | 0.259 |
| | | P value | 0.462 | 0.268 | 0.576 | 0.279 | 0.094 |
| Control (37) | Age | Spearman's rank correlation coefficient | -0.212 | -0.155 | 0.017 | 0.15 | 0.018 |
| | | P value | 0.207 | 0.36 | 0.921 | 0.375 | 0.918 |
| | Overjet | Spearman's rank correlation coefficient | -0.234 | 0.145 | -0.027 | -0.092 | -0.105 |
| | | P value | 0.163 | 0.393 | 0.875 | 0.587 | 0.537 |

## Discussion

People with malocclusions and dental deformities may experience physical, social, and psychological difficulties. Malocclusion treatment can be used efficiently to improve function, facial appearance, and dental aesthetics. Generally, patients report their motivations for seeking treatment are the functional and aesthetic factors or self-confidence and self-esteem; however, the number of patients reporting these motives varies widely between studies.

This study aimed to evaluate the effect of orthodontic growth modification treatments on the quality of life components of adolescents. In this regard, two groups between the ages of 11 and 14 years answered the CPQ questionnaire. The first group (case) consisted of the subjects who had a history of class II malocclusion (overjet more than 5 mm) and were at that time undergoing treatment. The second group (control) consisted of subjects with class II malocclusion and who have not been treated.

By comparing the results, we found out that in the four domains of the questionnaire, which included oral symptoms, functional limitations, emotional and mental health, and social welfare, the control group had higher scores in all components and therefore better quality of life compared to the case group. Although the difference was not statistically significant, the mean difference in emotional well-being was clinically meaningful.

The study's outcome was consistent with those of Palomares et al., who identified improved OHRQoL for adults who had finished orthodontic treatment and were in the retention phase versus their non-treated counterparts (10). Chinese orthodontic patients were found to have a better OHQoL after they finished treatment as compared with pre-orthodontic treatment and during the treatment by Chen et al (11).

A noteworthy point is that the effect of class II malocclusion on quality of life may be less than other types. For example, studies were conducted by Mostafa Quchani (2011) and Aydin Faceger (2014) on adolescent boys and girls ages 14 to 17. The crowding of teeth, especially in the anterior, which has a great impact on esthetic, has more negative effects on adolescents' quality of life (12, 13). However, it may not have a significant effect on a person's body image against class II malocclusion. Usually, people see their image in the mirror from the front, hence, the convex profile does not receive much attention. Therefore, the level of quality of life before treatment and in different types of malocclusions can have a wide spectrum, and an important factor is the effects of malocclusion on the beauty of the patient, it is expected that in adolescents, static is one of the most important and influential factors. However, many studies show that fixed orthodontic treatments regardless of malocclusion have increased quality of life (14).

In a study by Farzanegan et al., decreased quality of life at the beginning of fixed orthodontic treatment was reported, however, it gradually increased and at the end of treatment, significant improvement was observed compared to pre-treatment (6). This result falls in the same direction as the Zhang study done in 2008 (15).

Conflicting results include the Taylor Study in 2009 (16). In this study, there was no significant difference in the quality-of-life components after treatment compared to pre-treatment. Also, in the WC study. Shaw did not find enough evidence of the long-term effect of the need for orthodontic

treatment on the mental health of individuals (17). However, in a systematic review article published in 2015 with a review of high-quality articles, the undesirable effect of malocclusion on the quality-of-life index, especially in psychological and social dimensions, was concluded (18).

**Conclusion**

This study aimed to show that malformations in the jaws and teeth can harm adolescents' quality of life. Hence, the effects of one of the oral malformations on the quality of life of adolescents 11-14 years old was investigated. The patients with class II malocclusion in the four components of oral symptoms, oral functioning limitation, mental health, and social welfare had a lower quality of life score in the CPQ questionnaire than those treated. Although the difference in the quality-of-life components had not reached a statistically significant level, the difference between the two groups in the mental health component was clinically significant. The excessively normal front of the maxilla, which causes a convex half-face, can affect adolescents' emotional and mental health. Therefore, paying attention to malocclusion and its appropriate treatment effectively can improve the quality of life in children and adolescents and many studies confirm this. Also, parents should pay special attention in this regard, particularly in case of limitation of function in the oral area (such as difficulties in chewing or speaking, etc.) or cosmetic defects, and their effect on the psychosocial health of children and adolescents. Therefore, it is recommended to go to a general dentist or orthodontist to receive necessary guidance.

**Conflicts of interest:** None to declare.

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