

# Orthodontic Treatment and the Oral Health-Related Quality of Life of Patients

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## Abstract

**Objective:** Malocclusion is a common oral disorder, can cause negative impacts on oral conditions, social life and patients' self confidence. The objective of this study was to determine whether orthodontic treatment influence oral health related quality of life (OHQoL).

**Materials and Methods:** Cross-sectional design with self-reported data were collected from 302 participants attended at professional orthodontic office (62% female; mean age, 21.71 years) in two "treatment" and "no treatment" groups. The measure namely (oral health impact profile) OHIP-14 was used to assess the patient's OHQoL. Linear regression model was used in the data analysis.

**Results:** A significant relationship was found in one question and one domain of OHIP-14 between the two groups ( $P < 0.05$ ) which showed difference in physical limitation. Linear regression model showed that in the treatment group, this domain of OHQoL was 1.86 times less likely complicated than in the "no treatment" group.

**Conclusion:** Patients who had completed orthodontic treatment had a better OHQoL in physical aspects than those who never had treatment.

**Key Words:** Oral Health-Related Quality of Life, OHQoL, Orthodontic Treatment

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## INTRODUCTION

Malocclusion is one of the most common tooth development anomalies, which usually manifests itself during childhood as a malalignment of teeth or an improper relationship of dental arches [1, 2]. Some researchers believe that malocclusion is a deviation from a normal esthetic appearance rather than a health disorder

in the general population [3, 4]. Several studies have evaluated the prevalence of malocclusion in various populations and have reported different prevalence rates (39-98%) [1,5]. Malocclusion results in various problems in the affected individuals, including lack of satisfaction with facial appearance, problems associated with the function of the masti-

catory system, dysfunction of the temporomandibular joint, problems with swallowing and speech, susceptibility to facial traumatic injuries and development of caries and periodontal problems [6]. In addition, the individuals with malocclusion will not be satisfied with their facial appearance, resulting in inappropriate social responses and development of emotional and mental problems [1, 7]. In other words, Oral Health-Related Quality of Life (OHQoL) is disturbed in a large proportion of affected individuals [7]. Orthodontic treatments comprise a large proportion of dental treatment and in most cases they are carried out during adolescence and early adulthood to solve malocclusion problems [2, 6].

The quality of life is defined as a subjective judgment of an individual of his/her health status and in fact satisfaction or dissatisfaction with specific aspects of life, which are important for the individual [8]. At present, disturbances in the normal somatic, psychosomatic and social functioning of individuals are considered important considerations in the evaluation of oral health. Inability of commonly used tools to evaluate and quantify oral health, such as evaluation of the ability of patients to chew food and enjoy the taste of food items, has resulted in a new direction and attitude toward evaluation of oral health by new quantification tools such as OHQoL [9-12].

The relationship between the quality of life and malocclusion has not been established. However, evidence suggests that evaluations in relation to a need for correction of malocclusion should be patient-oriented or subjective. In other words, the need for orthodontic treatment is related to OHQoL, but it is not necessarily related to objective (clinical) criteria [13], because clinical criteria reflect the severity of the problem and orthodontic treatment, compared to other dental treatments, is much more greatly under the influence of social and emotional factors. A large number of researchers believe that clinical evaluation alone has serious limitations given the accurate

definition of health as something beyond the boundaries of clinical dimensions and social and emotional aspects should be incorporated in it [14]. Therefore, it is necessary that clinical criteria be replaced by OHQoL tools to evaluate patient need for orthodontic treatment [4, 8]. Several studies have evaluated the relationship between malocclusion and the quality of life in relation to oral health, with somewhat contradictory results [4, 15-17].

Taylor et al. (2009) reported no significant relationship between orthodontic treatment and changes in the quality of life [10]. A study by Leao and Sheiham (1996) showed that young individuals who had received orthodontic treatment during the previous ten years had a better quality of life compared to those who had not received such a treatment [16]. Oliveira and Sheiham (2003) reported that the quality of life in relation to oral health was 1.43 times higher in patients who had completed a course of orthodontic treatment compared to individuals who had not undergone such a treatment [1]. Vig et al. (2007) concluded that orthodontic treatment ultimately results in patients' satisfaction with their dental status and an increase in their self-confidence compared to individuals not receiving such a treatment [18]. Zhang et al. (2007) reported a significant improvement in the quality of life of their patients 6 months after orthodontic treatment [19].

OHQoL criteria have rarely been used in dental research in our country, though as it was pointed out earlier evaluation of the need for orthodontic treatment should include quantification of the effect of malocclusion or dental deformities on patients [5]. In the same context, the effects of oral health and diseases related to it, the appearance of teeth, malocclusion and treatment of such anomalies on emotional, mental and social health of patients have been the focus of attention of clinicians and researchers all over the world during the past decade [12]. Considering the established relationship between esthetic, health and satis-

fection with individual's appearance and social function, malocclusion might result in a decrease in self-confidence and individual's social functioning, especially in adolescents. Iran has one of the youngest populations in the world and evaluation of OHQoL is very important in this age group; however, no studies have ever used OHQoL criteria in patients undergoing orthodontic treatment in Iran. Therefore, the quality of life as related to oral health in patients undergoing fixed orthodontic treatment was evaluated and compared with that in patients needing orthodontic treatment in order to shed more light on the effect of orthodontic treatment on OHQoL in orthodontic patients in our community.

### MATERIALS AND METHODS

In the present cross-sectional study, the quality of life as related to oral health was evaluated and compared between two case and control groups. The case group patients were selected from the patients who were already referred to a private orthodontic clinic and had received fixed orthodontic treatment based on a diagnosis established by an orthodontist. Only patients who were 14 and over 14 years of age and had completed the orthodontic treatment course were included in the study. Questionnaires were filled out during one of the follow-up sessions after treatment [17]. The control group subjects were selected from patients who had been referred to the same private clinic and were candidates for orthodontic treatment. These subjects were included in the study to be evaluated before the orthodontic treatment was instituted. Sampling was carried out for both groups consecutively. Subjects with a history of maxillofacial surgeries, any systemic or mental problems and any manifest disorders in the general growth pattern were excluded from the study [8]. Before orthodontic treatment was instituted, routine dental treatments were carried out for all the subjects. Therefore, the subjects in both groups were

matched in relation to the influence of dental problems, such as carious lesions, on the quality of life. The aims of the study were explained to the subjects who volunteered to participate in the study. Patient's data were all kept confidential.

An OHIP-14 (Oral Health Impact Profile-14) questionnaire, which is the most valid tool to evaluate OHQoL in all the age groups, was filled out for all the study parts in one session in the form of an interview. OHIP-14 consists of 14 questions, which measures the quality of life in seven fields of functional limitations, physical problems, mental and emotional problems, physical handicaps, mental and emotional handicaps, social handicaps and complete handicap. In this questionnaire, question 1 of each two questions evaluates one of those fields. The interviewee answers each of these questions in relation to experiencing a problem arising from the teeth and the oral condition during the past twelve months. The subject's answers are scored in the Lickert's scale as "zero" for "never", "1" for "seldom", "2" for "sometimes", "3" for "mostly" and "4" for "almost always". On the whole, a score ranging between "0" and "56" is calculated for each subject. Higher scores indicate a lower quality of life for the subjects. In the present study, in the final evaluation of answers, the "zero" response was considered a lack of effect and answers 1 to 4 were considered an effect so that the comparisons would be more comprehensible [17]. The original questionnaire is in English, which has been translated into Farsi and the validity and reliability of the Persian version has been confirmed [20]. Data was entered and analyzed by SPSS 17 for Windows (SPSS Inc., Chicago, Illinois, USA). Demographic characteristics of case and control groups were compared using Chi-square and independent T test for categorical and numerical variables, respectively. We fitted a linear regression model to predict the mean of OHIP score considering potential con-

founding variables. The association between oral health-related quality of life and orthodontic treatment were measured by Chi-squared test and the effect sizes were reported by odds ratio.

## RESULT

A total of 302 subjects were evaluated in the present study, of which 150 belonged to the case group and 152 belonged to the control group. All the subjects answered the questionnaire questions (response rate=100%). Females and males comprised 62.25% and 37.75% of the subjects, respectively. The highest and lowest educational levels of the subjects were high school diploma (57.28%) and high school students (12.91%), respectively. The mean age of the subjects was  $21.71 \pm 3.49$  years. In the case (treated) group the average time from the initiation of treatment was  $12.44 \pm 5.74$  months. The mean of OHIP-14 parameters were 13.54 and 13.71 in the treated (case) and underrated (control) groups, respectively, with no statistically significant differences ( $P > 0.05$ ). The mean OHIP-14 parameters in the two groups did not reveal any differences in relation to the subjects' age, gender and educational status ( $P > 0.05$ ). In the comparison of the "treated" and "untreated" group the only question whose answer revealed a statistically significant difference was question 2, which ran as follows "Have you experienced any problems with the taste of foods as a result of problems with your teeth and the oral cavity" The Linear regression model of this question showed that the odds of a disturbance in this quality of life in the untreated subjects was 2.09 times higher than that in the subjects treated (Table 1). In other words, absence of a significant difference between the two groups in relation to answers to the other 13 questions shows that according to the answers provided by the subjects, orthodontic treatment has had no significant effect on improving the other aspects of their OHQoL.

Table 2 shows that in the comparison of the fields of the quality of life under study between the two groups only the first domain of the OHIP-14 questionnaire revealed statistically significant differences ( $P < 0.05$ ). In other words, based on the Linear regression model, used physical functions, which includes the oral functions, were disturbed 1.86 times less in the subjects undergoing orthodontic treatment compared to subjects not receiving the treatment; no such a significant difference was observed in the other domains ( $P > 0.05$ ).

## DISCUSSION

The present study evaluated and compared the quality of life as related to the oral health (OHQoL) in the two groups of patients who had received and had not received fixed orthodontic treatment. The study made an attempt to determine the various aspects of the effect on the quality of life in cases in which the treatment had an effect on improvement of OHQoL parameters.

The first consideration which becomes evident in comparison of different studies in this respect is the difference in the tools used to evaluate the effect of orthodontic treatment on the quality of life of patients. Some researchers have used general tools of evaluating the quality of life, such as SF36, which is mostly used in studies in medicine. Taylor (2009) believes despite the fact that orthodontic treatment improves appearance, oral functions and the social health of patients, it does not seem to exert a significant influence on their general quality of life [10]. Azuma (2008) used two general and oral-specific (OHQoL) questionnaires simultaneously in his study and concluded that oral-specific questionnaires show improvements in the quality of life after correction of malocclusion; however, general questionnaires, such as SF36, do not show such changes [7]. A large number of studies which are similar to the present study have used two CPQ and Child-OIPD tools, of which studies by Mtaya, Zhang and O'Brien can be

**Table 1.** Frequency Distribution of Reported Impacts on the 14 Items of the Oral Health Impact Profile Measure (OHIP-14) and Orthodontic Treatment Status

<b>Daily activity</b>	<b>Treated (%)</b>	<b>Untreated (%)</b>	<b>P Value</b>
<b>Had problem pronouncing words</b>			
Impact	22 (14.67)	33 (21.71)	0.113
No impact	128 (85.33)	119 (78.29)	
<b>Felt their sense of taste has worsened</b>			
Impact	14 (9.33)	27 (17.76)	0.032
No impact	136 (90.67)	125 (82.24)	
<b>Had a painful aching in the mouth</b>			
Impact	105 (70)	101 (66.45)	0.507
No impact	45 (30)	51 (33.55)	
<b>Found it uncomfortable to eat any food</b>			
Impact	87 (58)	87 (57.24)	0.893
No impact	63 (42)	65( 42.76)	
<b>Have been self conscious</b>			
Impact	76 (50.67)	88 (57.89)	0.207
No impact	74 (49.33)	64 (42.11)	
<b>Felt tense</b>			
Impact	45 (30)	54 (35.53)	0.306
No impact	105 (70)	98 (64.47)	
<b>Had an unsatisfactory diet</b>			
Impact	35 (23.33)	35 (25)	0.735
No impact	115 (76.67)	114 (75)	
<b>Had to interrupt meals</b>			
Impact	49 (32.37)	43 (28.29)	0.409
No impact	101 (67.33)	109 (71.71)	
<b>Found it difficult to relax</b>			
Impact	47 (31.33)	56 (36.84)	0.313
No impact	103 (68.67)	96 (63.16)	
<b>Have been a bit embarrassed</b>			
Impact	29 (19.33)	42 (27.63)	0.089
No impact	121 (80.67)	110 (72.73)	
<b>Have been irritable with other people</b>			
Impact	24 (16)	21 (13.82)	0.594
No impact	126 (84)	131 (86.18)	
<b>Had difficulty doing usual jobs</b>			
Impact	17 (11.33)	11 (7.24)	0.220
No impact	133 (88.67)	141 (92.67)	
<b>Felt life in general less satisfying</b>			
Impact	14 (9.33)	14 (9.21)	0.971
No impact	136 (90.67)	138 (90.79)	
<b>Have been totally unable to function</b>			
Impact	5 (3.33)	10 (6.57)	0.23
No impact	145 (96.67)	142 (93.43)	

mentioned [1, 11, 19]. In the studies referred to, the subjects' age range was 11-14 years, which is why the two above-mentioned tools specific for younger ages were used. However, in a study carried out by Oliveira and Sheiham, in which the subjects were 15-16 years of age, OHIP-14 was used similar to the present study [17]. In the present study, there were no significant differences in the means of whole OHIP-14 scores between the two treated and untreated groups; however, in a study carried out by Oliveria and Sheiham, the quality of life in the treated subjects was 1.43 times better than that in the untreated subjects [17]. The untreated subjects reported the disturbance of "food taste perception" among 14 other aspects and disturbance of "physical functioning" among 7 other aspects in a significant manner compared to the treated subjects, which is consistent with the results of a study by Gherunpong (2004), who reported that patients believed malocclusion had an effect on physical activity, especially eating [21].

The results of two studies by Leao and Zhang are different from those of the present study. They reported an improvement in the quality of life of patients in mental and emotional fields, such as appearance [16, 19]. Therefore, it is evident that there is wide variation in patient satisfaction after orthodontic treatment. It is important to note that the mental/emotional status and the baseline self-confidence level of patients before treatment have an influence on their idea about improvement in this aspect of life quality after treatment [8]. The major outcome expected of orthodontic treatment is an improvement in the function and appearance of patients, which will lead to an increase in the mental, emotional and social health of patients.

However, there is controversy over the effect of the treatment on those aspects. The patients' subjective assessment has a key role in this respect. It is possible that esthetics and acceptable occlusion standards are different from the patient's and community's view even the role

**Table 2.** Frequency Distribution of Reported Impacts on the 9 Domains of the Oral Health Impact Profile Measure (OHIP-14) and Orthodontic Treatment Status

Dimensions	Treated (%)	Untreated (%)	P Value
<b>Functional limitation</b>			
Impact	84 (56)	107 (70.39)	0.009
No impact	66 (44)	45 (29.67)	
<b>Physical pain</b>			
Impact	143 (95.33)	136 (89.47)	0.055
No impact	7 (4.67)	16 (10.53)	
<b>Psychological discomfort</b>			
Impact	129 (86)	139 (91.45)	0.134
No impact	21 (14)	13 (8.55)	
<b>Physical disability</b>			
Impact	112 (74.67)	115 (75.66)	0.842
No impact	38 (25.33)	37 (24.34)	
<b>Psychological disability</b>			
Impact	111 (74)	126 (82.89)	0.06
No impact	39 (26)	26 (17.11)	
<b>Social disability</b>			
Impact	79 (52.67)	68 (44.74)	0.168
No impact	71 (47.33)	84 (55.26)	
<b>Handicap</b>			
Impact	48 (32)	41 (26.97)	0.338
No impact	102 (68)	111 (73.03)	

of ethnic differences have been reported as factors involved in the improvement in social acceptance after treatment [5].

It is also possible that with a larger sample size, a number of other areas except for function might have achieved statistical significance.

In the present study, no significant relationship was observed between gender and OHQoL in the subjects.

The results of similar studies show that despite greater expectations of females in relation to improvement in social acceptance after treatment, gender differences cannot be considered predicting factors for OHQoL [5, 8].

The results of the present study did not reveal a significant relationship between age and the educational status of the subjects and their OHQoL.

The results of a study in Amsterdam showed that young adults have greater expectations in relation to improvement in their appearance compared to adolescents [5], despite the fact that young adults do not expect their oral functions to improve in the same manner as their appearance. In children, esthetic appearance results in an increase in self-confidence, with social idols playing a role in this respect; heroes in movies usually have beautiful teeth, but in most cases, bad men have broken and discolored teeth [8]. In the present study, orthodontic treatment was rendered by an orthodontist.

A study on 139 general dental practitioners and 28 orthodontists in Northern Ireland showed that general dental practitioners rendering such treatment pay more attention to the functional aspects in patients while orthodontists concentrate on the mental, emotional and social advantages of treatment [5].

As discussed previously, in the present study, the patients reported more improvement in the functional aspects after orthodontic treatment compared to improvement in the mental aspects and social acceptance, which might be attributed, in addition to what was discussed

before, to the lack of specific questions about orthodontic treatment in the questionnaires available, including the questionnaire used in the present study, influencing the results [14]. Besides, maintaining a high level of oral hygiene and cooperation with regular visits by the patients are two aspects which influence the final evaluation of changes as a result of orthodontic treatment.

At present, the majority of researchers believe that the "type of occlusion" does not influence OHQoL, but further studies are necessary in this regard.

## CONCLUSIONS

The results of the present study showed that fixed orthodontic treatment, in addition to its known effects on the patients' facial esthetic considerations, results in an improvement in the quality of life as related to oral health in the functional aspects of the oral cavity.

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