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The role of Orthodontic Treatment on Patient's Mental Health, Body Image, and Oral Health-Related Quality of Life Orthodontic Treatment and its Effects on Psychological Factors

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Abstract

Objective: The present study has investigated the role of orthodontic treatment on patients' mental health, body image, and oral health-related quality of life.

Method: In this quasi-experimental study, a sample of 90 patients referring to orthodontic clinics in the city of Kermanshah were selected using the purposive sampling method, and then they were assessed before and 6 months and one year after undergoing orthodontics via the "The Symptom Checklist-90-R" (SCL-90-R), "Multidimensional Body–Self Relations Questionnaire" (MBSRQ), and Oral Health Impact Profile (OHIP-14). Data were analyzed using a one-way analysis of variance.

Results: patients reported less obsessive compulsion, hostility, and paranoid ideation symptoms on (SCL-90-R) after six months and one-year treatment ($P < 0.05$). In addition, the comparison of scores before and after treatment showed that there was a significant difference in appearance evaluation and body areas satisfaction dimensions of MBSRQ ($P < 0.05$). Also, there were significant differences in physical disability, psychological disability, social disability, and total score of OHIP-14 before and after treatment ($P<0.05$).

Conclusion: This quasi-experimental study highlights orthodontic treatment's role on mental health body image and oral health-related quality of life in patients with dental problems.

Keywords: Orthodontic treatment, mental health, body image, oral health-related, quality of life.

Introduction

Oral and dental problems can have negative physical, psychological and social effects on an individual's life (Khadem, Maroofi & Ghasemi, 2011, Bellot Arcís, Montiel – Company & Almerich –Silla, 2013, Jung, 2010, Bellot-Arcís, Montiel-Company, Pinho & Almerich-Silla, 2015, Maya, Astrom & Brudvik, 2008). Quality of life, in particular oral health-related quality (Scapini, Feldens, Ardenghi & Kramer, 2013; Sardenberg, Martins, Bendo, et al., 2013) self-esteem (Bellot-Arcís et al., 2015; Jung, 2015, Taibah & Al-Hummayani, 2017, Choi, Ji & Yun, 2018), body image (Khadem, Maroofi & Ghasemi, 2011, Choi et al., 2018), personal characteristics, and personality traits (Newton, Prabhu & Robinson, 2003; Sinko, Jagsch, Benes, et.al, 2012) can be affected by oral and dental problems. For example, malocclusion can have a negative impact on quality of life, social interaction, interpersonal relationships, and psychological well-being (De Paula, Júnior, Santos, et al., 2009). Malocclusion also was associated

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with a greater negative impact on social well-being (Bittencourt, Martins, Bendo, et al., 2017). One study indicated that patients with skeletal malocclusion presented more myofascial pain, severe depression, and chronic pain compared with patients without malocclusions (Sebastiani, Meger, Bergamashi, et al., 2019). Low self-concept and shame feeling in a social context may be reported in individuals with malocclusion (Fernandes, Ruta, Ogden, et al., 2006). Body image is defined as a multidimensional construct that describes an individual's mental representation of his or her own body (Bolton, Pruzinsky, Cash, et al., 2003). A negative body image involves a distorted perception of one's shape. Several studies reported that negative body image correlates with certain mental health conditions, such as depression, anxiety, low self-esteem, obsessive-compulsive behaviors (Paxton & Franko, 2010), and eating disorders (Piacentino, Kotzalidis, Longo, et al, 2017). Also, Body image is one of the strong motivations for performing various cosmetic surgeries (Mafakheri, Ashrafifard & Khorrami, 2021; Zoghipaidar, Karami & Nabizadeh, 2018). More recently, researchers have begun to examine the relationship between oral and dental diseases such as malocclusion and body image. In dental research, results indicated that orthodontic treatment could improve multidimensional attitudes toward body image and increase mental health (Imani, Jalali, Dinmohammadi & Nouri, 2018).

Oral health-related quality of life (OHRQOL) is defined as a multidimensional concept that shows patients' comfort with eating, speaking, communication, and participation in social interactions without any limitation (Bennadi & Reddy, 2013; Chen, Feng, Liu, et al., 2015). This topic has gained important attention in recent years and is known by the World Health Organization (WHO) as an important part of the Global Oral Health Program (Sischo & Broder, 2011). Therefore, today, there has been growing interest in assessing the impact of oral and dental diseases on the Oral health-related quality of life. A search conducted on the Korean population indicated that the increased age of patients and severity of the malocclusion decreased oral health-related quality of life and masticatory function (Choi, Kim, Cha & Hwang, 2016). Several studies have investigated the effects of various dental treatment outcomes on Oral health-related quality of life. Findings from systematic reviews of endodontic treatment indicate that the QOL of patients improved after treatment (Neelakantan, Liu, Dummer & McGrath, 2019). One study that assessed long terms effect of orthodontic treatment on oral health-related quality of life in a cohort of cleft, surgery, and standard patients showed that improvements in (OHRQOL) after orthodontic treatment were maintained over time for surgery patients, but not for those with standard malocclusions and orofacial clefts (Nichols, Antoun, Fowler, et al., 2018).

Taken together, it seems that it is a significant relationship between psychological, oral, and dental health. Numerous studies have suggested ways to reduce the negative psychological and physical effects of oral and dental disease such as orthodontic treatments. Orthodontic treatments, particularly with fixed appliances, have been used for various conditions including dental caries, temporomandibular joint abnormalities, and the like (Chen & Zhou, 2015; Gupta, Singh, Tallents & Rossouw, 2017). Another important application of orthodontic treatments is for the management of malocclusion and dentofacial deformities (Andiappan, Gao Bernabe, et al., 2015). Some research indicated that orthodontic treatments not only improve OHRQOL but also have been shown to have a positive effect on mental health (Kang & Kang, 2014) and Body image satisfaction of the patients (Imani et al., 2018). However, the results of some studies have also shown that orthodontic interventions do not affect patients' body Image or quality of life (Bellot-Arcís, Ferrer-Molina, Carrasco-Tornero, et al., 2014, Johal, Alyaqoobi, Patel & Cox., 2014). In another study, there was

no significant difference between the results of psychological tests such as SCL-90 among patients who had undergone orthognathic surgery before and after the surgery (Prabakaran, Seymour, Moles & Cunningham, 2012).

Therefore, the results of previous research on the effect of orthodontic interventions on mental health, quality of life, and body image are contradictory. Further studies are hence needed to provide additional evidence of this association. Accordingly, the objective of this study was to determine the effect of orthodontic treatment with fixed appliances on mental health, body image, and OHRQOL of patients.

Method

Participants and Procedure

This research was a cross-sectional and quasi-experimental study. The sampling method was convenience sampling. During the three months (between January from March 2018), all patients who were referred for orthodontic treatment with fixed appliances to university clinics in Kermanshah city were assessed. Using a purposive sampling method and based on inclusion and exclusion criteria a sample of 95 patients were included. Inclusion criteria were conscious consent to participate in the study, ability to read and write, and age equal to or older than 15 years. Exclusion criteria were history of previous orthodontic treatment, jaw abnormalities, chronic medical conditions, facial and psychiatric disorders, taking psychotropic medications, and patients younger than 14 years. The three used instruments were filled out by patients before treatment, 6 months, and 1 year after treatment.

Ethical Statement

The research was carried out following ethical and legal guidelines on the protection of personal data and research with human beings in the 2013 Helsinki Declaration. All participants were properly informed about the research procedure. Each participant was provided written instructions about the study purpose and the way of completing the questionnaires. Voluntary participation and anonymity were emphasized. No identifying information was requested. Informed consent was obtained from the participant. Also before conducting research, a favorable report [IR.KUMS. REC.1395.156] was obtained from the research ethics committee of Kermanshah University of medical sciences.

Measures

In this study, three questionnaires were used including "The Symptom Checklist-90-R" (SCL-90-R), the "Multidimensional Body–Self Relations Questionnaire" (MBSRQ, 46 items), and Oral Health Impact Profile (OHIP-14).

The SCL-90-R assesses nine dimensions including somatization, obsessive compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. The reliability and validity of the Persian translation of this instrument have been approved in a previous study (Modabernia, Shojaie Tehranie, Falahi & Faghirpour, 2010). In the SCL-90-R, each question is graded on the five-point Likert scale from 0 = none at all to 4 = very severe. The interpretation is made based on Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST). GSI: This index is the best indication for the current level or depth of psychological disorder and is used in most cases where a summary measurement is required. The GSI has provided information on the number of symptoms and the severity of the discomfort caused. According to the general rule, T scores higher than 63 indicates a considerable level of psychological disorder. PSDI: This index is a net index of discomfort. In other words, it is a revised measure of severity of symptoms, and more likely a response measure to indicate whether a depressed person presents his/her symptoms correctly. PST: This indicator counts the number of symptoms that

the patient reports positively, that is, those that the patient himself acknowledges to some extent.

The MBSR-46 *includes several subscales*: appearance evaluation, appearance orientation, overweight preoccupation, self-classified weight, and body areas satisfaction. The patient rates the questions with five possible answers: (1= completely opposed, 2= often opposed, 3= abstained, 4= often agree, and 5= fully agree). The MBSRQ assesses body image as a multidimensional construct. It has 46 questions in six dimensions including appearance evaluation, appearance orientation, fitness evaluation, fitness orientation, overweight preoccupation, and body areas satisfaction scale (BASS). The MBSRQ contains questions about thinking, feeling, and behavior. The reliability and validity of the Persian translation of this instrument have been approved in a previous study (Safavi, Mahmoodi & Roshandel, 2009).

The OHIP-14 assesses OHRQOL which contains 14 questions. It assesses OHRQOL via seven dimensions namely functional limitation, physical discomfort, psychological discomfort, physical disability, psychological disability, social disability, and handicap. This is a validated subjective index for information about the possible effects that oral conditions may have on the patient's quality of life and requirement for dental treatment (Husain & Tatengkeng, 2017). The reliability and validity of the Persian translation of this instrument have been approved in a previous study (Navabi, Nakhaee & Mirzadeh, 2010). The 14 questions are divided into 7 dimensions (2 questions per dimension). Responses to the items are scored in a 5-point Likert scale: 0 =never; 1=hardly ever; 2=occasionally; 3=often; 4= very often.

Data were analyzed using SPSS version 26.0. Descriptive indices including frequency, percentage, mean, and standard deviation (SD) were used to express data. Sociodemographic variables such as age, gender, and marital status were analyzed by descriptive statistics. Mean and standard deviation scores were determined for the overall SCL-90-R, MBSRQ, and OHIP-14.

The parametric test- repeated measures analysis of variance (ANOVA). was applied to determine any significant change in the scores obtained by the research tools in three measurements. A P value of less than 0.05 was considered statistically significant. To analyze the variance of repeated measures, the relevant statistical assumptions were first examined. The dependent variable was quantitative and the number of levels of the independent variable was more than one class. There were no outliers in the related groups. The normality of the dependent variable distribution was evaluated and confirmed by the Shapiro-Wilk test. In this test, the significance level is greater than 0.05 ($p = 0.39$) and as a result,

Table 1: One-way ANOVA results of SCL-90 ubscales at baseline, 6 months, and 1 year after the study enrollment

	Baseline	Six months	One year	F	P value
Somatization	0.58 (0.61)	0.55 (0.54)	0.51 (0.52)	4.56	0.115
Obsessive compulsion	1.91 (0.7)	1.86 (0.68)	0.8 (0.64)	9.78	0.040
Interpersonal sensitivity	0.65 (0.58)	0.61 (0.6)	0.58 (0.56)	3.89	0.205
Depression	0.62 (0.62)	0.62 (0.63)	0.57 (0.58)	4.02	0.181
Anxiety	0.61 (0.6)	0.59 (0.59)	0.55 (0.55)	5.93	0.159
Hostility	4.14 (4.33)	3.61 (0.57)	0.57 (0.3)	16.21	0.000
Phobic anxiety	0.44 (0.5)	0.47 (0.51)	0.45 (0.47)	2.46	0.761
Paranoid ideation	4.95 (0.74)	2.92 (0.71)	0.9 (0.67)	14.64	0.000
Psychoticism	0.58 (0.57)	0.57 (0.57)	0.54 (0.52)	3.24	0.426
GSI	0.63 (0.50)	0.61 (0.51)	0.58 (0.48)	4.78	0.312
PSDI	0.017(0.005)	0.016 (0.005)	0.016 (0.004)	2.09	0.721
PST	34.61 (19.82)	35.90 (21.34)	33.15 (19.61)	3.98	0.431

the distribution of scores is normal. The sphericity hypothesis (homogeneity of group radon variances) was also tested and confirmed by Mauchly's Statistics (p = 0.12).

Results

In this study, the sample consisted of 95 participants. Of the 95 patients, 22 (23.2%) were males and 73 (76.8%) were females. Fifty-six (58.9%) patients were between the ages of 15 and 24. Thirty-nine (41.1%) patients were over 25 years old. In this group, 75 (78.9%) participants were single and 20 (21.1%) were married; 43 (45.3%) of the participant had undergraduate and graduate degrees, and 51 (53.7%) had a university degree. The sample group consisted of 69 (72.6%) patients with class I, 18 (18.9%) class II, and 8 (8.4%) class III malocclusion.

Table 1 shows the results of a one-way analysis of the variance of SCL-90 Subscales. One-way ANOVA showed that there was a significant difference in scores of obsessive compulsion, hostility, and Paranoid ideation subscales, at baseline, six months, and one year after treatment (P < 0.05).

Table 2 shows the results of one-way ANOVA of the Multidimensional Body–Self Relations subscales. Results showed that there was a significant difference in scores of appearance evaluation, body areas satisfaction scale, and total score of MBSRQ at baseline, six months, and one year after treatment (P < 0.05).

Table 3 shows the results of one-way ANOVA of the OHIP-14 dimensions. Results showed that there was a significant difference in scores of physical disability, psychological disability, social disability, and total score of OHIP-14 (P < 0.05).

Table 2. The results of one-way ANOVA of the Multidimensional Body–Self Relations subscales at baseline, 6 months, and 1 year after the study enrollment

	Baseline Mean (SD)	Six months Mean (SD)	One year Mean (SD)	F	P value
Appearance evaluation	14.82 (3.55)	14.54 (3.64)	15.13(3.49)	10.87	0.04
Appearance orientation	30.84 (5.88)	30.02 (5.85)	30.43(5.01)	4.21	0.20
Fitness evaluation	7.4 (1.93)	7.24 (2.26)	7.35 (2.05)	5.34	0.18
Fitness orientation	30.93(6.25)	29.31 (6.57)	29.53(5.83)	5.98	0.10
Overweight	3.69 (1.45)	3.78 (1.61)	3.82 (1.47)	6.00	0.10
preoccupation	22.48 (7.94)	22.69(8.13)	23.44(7.16)	8.52	0.05
BASS MBSRQ	108.35(18.43)	105.74(19.88)	109.16(14.7)	7.53	0.08

Discussion and Conclusion

This study was conducted to determine the effect

Table 3. The results of one-way ANOVA of the OHIP-14 dimensions, at baseline, 6 months, and 1 year after the study enrollment

	Baseline	Six months	One year	F	P value
Functional limitation	0.44 (0.65)	0.62(0.68)	0.57 (0.63)	9.64	0.09
Physical discomfort	0.97 (0.97)	0.98(0.74)	0.94 (0.71)	5.32	0.11
Psychological discomfort	1.37 (0.81)	1.17(0.75)	1.16 (0.74)	5.01	0.10
Physical disability	0.73 (0.68)	0.72(0.64)	0.65 (0.58)	11.34	0.04
Psychological disability	0.96 (0.69)	0.83(0.62)	0.75 (0.59)	12.02	0.03
Social disability	0.56 (0.68)	0.54 (0.6)	0.5 (0.59)	17.00	0.000
Handicap	0.75 (0.76)	0.67(0.64)	0.63 (0.63)	4.83	0.10
OHIP-14	5.79 (3.64)	5.53(3.24)	3.22 (3.09)	9.96	0.05

of orthodontic intervention on mental health, body image, and quality of life.

The results showed that orthodontic treatment increased the level of mental health of patients. After six months and one year of treatment, patients reported less obsessive compulsion, hostility, and paranoid ideation symptoms. The results of related studies have shown that mental health can significantly be increased by orthodontics treatment (Imani, et al, 2018; Kang & Kang, 2014, Deng, Wang, Deng, et al., 2018). Motegi et al. (2003) reported that in patients undergoing orthodontic treatment and after 5 years, the mean scores for each of the three domains of the SCL-90 significantly increased compared to preoperative conditions. In a preliminary study, Nagamine et al. showed that the psychological and personality problems that were investigated in the SCL-90 questionnaire improved in 78% of patients undergoing orthodontic surgery (Nagamine, Kobayashi, Hanada & Nakajima, 1989). It seems that positive body image after orthodontic treatment is one of the important factors in the reduction of obsessive thoughts and behaviors in the patients. On the other hand, research has shown that improvement of "social competitiveness", attractiveness, and psychological confidence are also implicit benefits of orthodontic treatment (Prabakaran, et al., 2012; Kenealy, Kingdon, Richmond & Shaw, 2007). Therefore, orthodontic intervention by improving social interactions and self-confidence resulted in a reduction of hostility and paranoid ideation symptoms in patients. In supporting this finding, Hunt et al. (2001) found that orthognathic surgery led to improvement in self-esteem, attractiveness, relationship with society, and emotional stability, in addition to improving personal relationships.

Another result of the research was that there was a significant difference in appearance evaluation and body area satisfaction before treatment and follow-up among patients. The results showed that after one year, the patients' evaluation of their body appearance and body area satisfaction had improved. The results of this study are consistent with research that has shown that orthodontic intervention impact an individual's mental image of one's body (Imani et al., 2018; Deng et al., 2018, Alanko, Tuomisto, Peltomäki, et al., 2017). In the present study, six months and a one-year follow-ups indicated that only two subscales, namely, evaluation of body appearance and body areas satisfaction had higher scores than the baseline, and no significant difference was observed in other subscales. One possible reason for this finding is gender differences. Several studies have shown that women and men may differ in body image evaluation and satisfaction (Halliwell & Dittmar, 2003). Considerable research has shown that women/girls are significantly more dissatisfied with their bodies than men/boys from adolescence through adulthood (Holmqvist, Lunde & Frisén, 2007). On the other hand, men and women have different conceptualizations of their bodies. Men tend to evaluate their bodies as a whole and functional entities whereas women tend to evaluate their bodies as a collection of different and distinct parts (Halliwell & Dittmar, 2003; Calogero & Thompson, 2009). In this study, women made up the majority of the sample (76.8%). Based on the previous findings on women's evaluation and satisfaction with body image (Halliwell & Dittmar, 2003; Calogero & Thompson, 2009; Holmqvist, Lunde & Frisén, 2007), it is possible that after orthodontic treatment, there had been no difference in women's satisfaction with their total body image, and, feeling of satisfaction was more related to one area of the body, namely the mouth and teeth.

Another factor that may have been influential is the age of the sample group. More than half of the patients (58%) were under the age of 25. The results of several studies have shown that dissatisfaction with body image is relatively common among adolescents and youth (Silva, Moraes, Martins, et al., 2020; Jacobson, Hall & Anderson, 2013). One's body image can be influenced by psychological,

social, and cultural factors (Cash & Pruzinsky, 2002; Fisher, 1990). Furthermore, body image is a multidimensional concept and complex entity that consists of self-perception or an Individual's mental representation of the integrity, the competence of their physical self, and social interpretation of their physical self (Cash & Pruzinsky, 2002; Alebachew & Ashagrie, 2017). Therefore, developing a positive body image, in addition to medical treatments, requires social and psychological interventions.

In this study, we also evaluated the impact of orthodontic treatment on oral health-related quality of life (OHRQOL). One-Year Follow-Up after orthodontic treatment indicated that there was a significant difference in the dimension of physical disability, psychological disability, social disability, and total score of Oral Health Impact Profile (OHIP-14) than before starting treatment. In this study, patients reported less physical, psychological, and social disability and higher oral health-related quality of life one year after treatment. In this regard, various studies that have examined the impact of orthodontic treatment on quality of life have reported that orthodontic treatment improves patients' quality of life especially oral health-related quality of life (Antoun, Fowler, Jack & Farella, 2003). A study on 52 patients with severe malocclusion and combined orthodontic and surgical treatment reported a significant difference between the quality of life before and after treatment (Silvola, Varimo, Tolvanen, et al., 2014).

The results of the present study are supported by the findings of previous studies that showed that unsatisfactory dental aesthetics may harm the social and emotional well-being of individuals (De Paula, et al., 2009; Bittencourt, et al., 2014). Maybe orthodontic treatment by improving aesthetics in the facial region led to increased self-concept and positive self-confidence often related to psychological and social well-being. On the other hand, in patients with severe malocclusions, problems in the facial region in general, such as jaw movements disorder, muscle pain, temporomandibular joint disorder, problems with chewing, swallowing, or speaking, exacerbation of the periodontal disease, are common physical complaints (George, 1999). Orthodontic treatments can improve the physical function and physical health of patients by helping to solve many of these problems.

In general, this quasi-experimental study highlights orthodontic treatment's role on mental health body image and oral health-related quality of life in patients with dental problems. In this study, the results showed that orthodontic treatments could increase mental health and reduce some symptoms such as obsessive compulsion, hostility, and paranoid ideation. In addition, the results indicated that orthodontic intervention improved patients' body image in body appearance and body area satisfaction dimensions. Another result of the study was that orthodontic treatment could improve oral health-related quality of life, especially in physical disability, psychological disability, and social disability dimensions. Despite this, the results of this study cannot be generalized to other populations. Indeed, this research is a cross-sectional study, so, to evaluate the long-term effects of orthodontic treatment, a cohort study should be performed.

More experimental studies are suggested to investigation of mediating psychological variables that could effect on patient's mental health, quality of life and body image during and after treatment and their expectations of orthodontic treatment.

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