TURKISH JOURNAL of ORTHODONTICS

DOI: 10.5152/TurkJOrthod.2021.21177

Original Article

Dental Anxiety and Fear Levels, Patient Satisfaction, and Quality of Life in Patients Undergoing Orthodontic Treatment: Is There a Relationship?

Zeynep Çoban Büyükbayraktar, Cenk Doruk

Department of Orthodontics, Sivas Cumhuriyet University Faculty of Dentistry, Sivas, Turkey

Cite this article as: Çoban Büyükbayraktar Z, Doruk C. Dental anxiety and fear levels, patient satisfaction, and quality of life in patients undergoing orthodontic treatment: Is there a relationship? *Turk J Orthod.* 2021; 34(4): 234-241.

Main Points

- Fear, anxiety, and quality of life are all topics that have been discussed extensively in the literature.
- A positive relationship between the doctor and the patient has a positive impact on both dental anxiety and the OHRQoL.
- There exists a significant relationship between dental anxiety levels and OHRQoL.

ABSTRACT

Objective: This study aimed to evaluate the relationship between dental anxiety and fear levels, patient satisfaction, and oral health-related quality of life (OHRQoL) in patients undergoing orthodontic treatment.

Methods: The study was conducted in the Department of Orthodontics, Sivas Cumhuriyet University Faculty of Dentistry. This cross-sectional study included 252 patients, aged 11-14 years undergoing orthodontic treatment. The data collection tools were the Index of Dental Anxiety and Fear (IDAF-4C$^+$), the Child Perceptions Questionnaire (CPQ 11-14), the Patient Satisfaction Questionnaire, and the Clinical Examination Data Form. The CPQ 11-14 was used to measure OHRQoL. Descriptive statistics, the independent samples *t*-test, analysis of variance (ANOVA), Cronbach's alpha, and Pearson coefficient were used for statistical analysis at a significance level of 0.05.

Results: The CPQ 11-14 parameters were sufficiently reliable, and the patients mostly had problems with oral symptoms. A significant difference was observed between the type of treatment, the initiation of treatment, emotional well-being, and social well-being ($P < .05$). The relationship between treatment satisfaction and all parameters was significant ($P < .05$). There was a significant relationship between IDAF-4C$^+$ and CPQ 11-14, while a moderate correlation was found between dental anxiety and emotional well-being.

Conclusion: According to the results of this study, the type of treatment, the initiation of treatment, and dental anxiety impact the quality of life. It was found that treatment satisfaction and a positive patient–dentist relationship positively affect the quality of life and dental anxiety.

Keywords: Personal satisfaction, dental anxiety, oral health

INTRODUCTION

Dental fear is a normal emotional response to threatening stimuli in dental treatments. Dental anxiety is defined as the response to a specific stressful stimulus. Dental anxiety is considered to be a condition.[1] Patient anxiety is a frequently encountered problem in most areas as the emotional expression of a normal state of anxiety or a pure and specific psychological fear of dentistry and medicine.[2] Mild fear and anxiety are compatible with normal development and expected experiences, but when fear and anxiety increase disproportionately, they disrupt daily functionality and need treatment.[3] In a study conducted among 200 patients undergoing orthodontic treatment, high degrees of dental fear were identified in young adults, and the most feared dental procedure was extraction.[4] In another study in which 675 patients were evaluated, it was reported that dental

Corresponding author: Zeynep Çoban Büyükbayraktar, e-mail: dtzeynepcoban@gmail.com
© Copyright 2021 by Turkish Orthodontic Society - Available online at turkjorthod.org

Received: January 1, 2021
Accepted: May 10, 2021
Available Online: October 26, 2021

anxiety was affected by the relationship with the orthodontist, orthodontic treatment perspective, and treatment factors.[5] The oral health status of anxious individuals is generally poor, and treatment is complicated, with longer sessions.[6] Moreover, these patients are usually dissatisfied with the treatment experience.[7] Anxiety appears as an important issue in orthodontics patients and is likely to affect the process of treatment.

Different methods have been developed to measure dental anxiety and fear. There is considerable literature examining the cognitive aspects of dental fear. For example, the Dental Belief Scale measures the subjective perception of dentist behavior, and the lack of power, control, and trust, and has been associated with dental fear.[8] There are many theoretical and practical limitations in measuring dental anxiety and fear. The Index of Dental Anxiety and Fear (IDAF-4C$^+$) is a self-reported measurement tool and examines dental anxiety and fear related to 4 components: cognitive, behavioral, emotional, and physiological. This measurement tool addresses dental anxiety and fear theoretically and psychologically.[9]

Patient satisfaction has become an important area of interest in the healthcare sector. Age, gender, motivation, anxiety, and discomfort affect the satisfaction level. Conditions such as discomfort from orthodontic appliances and the patient's anxiety cause dissatisfaction.[10] The quality of the service provided and the patient's expectations may affect patient satisfaction. A vast majority of individuals need orthodontic care.[11] It is essential to identify the percentage of patients who have received orthodontic therapy and are satisfied with the treatment outcomes. A study showed that 34% of patients were completely satisfied, 62% of patients were moderately satisfied, and 4% were dissatisfied with the orthodontic treatment rendered.[12] It is important for orthodontists to know the factors that will affect adolescent patients' satisfaction with orthodontic treatment.[13] The level of motivation, expectation, and subjective satisfaction after orthodontic treatment could be considered as important parameters in measuring the overall results and importance of orthodontic treatment.[10] Various surveys have been developed to measure patient satisfaction, for example, The Patient Satisfaction Questionnaire. In this survey, doctor–patient relationship, situational aspects, psychosocial and dentofacial improvements, and dental function are evaluated.[14] It is seen that doctor–patient relationship has an important place in measuring satisfaction.

The assumption that the dentoalveolar status is one of the most important factors in smile esthetics, attractiveness, and happiness has led to an increase in the popularity of orthodontic treatment in children and adults, which is indicated by the concept of oral health-related quality of life (OHRQoL).[15] OHRQoL is defined as a positive sensation that leads to the development of dentofacial self-confidence and an absence of the adverse effects of poor oral conditions on social life. Oral health has a significant impact on the physiological, social, and psychological health of a person.[16] The Child Perceptions Questionnaire (CPQ)-11-14 takes a broad look at oral, dental, and orofacial disorders.[17] During orthodontic treatment, the patient may encounter difficulties while eating, drinking, speaking, and in maintaining oral hygiene, depending on the type of treatment.[18] These challenges may also affect patient satisfaction.

As a result of the literature review, it is thought that there may be a relationship between dental anxiety and fear and quality of life.[19] The relationship of these factors with patient satisfaction is uncertain. This study aimed to evaluate the dental anxiety and fear levels, satisfaction status, and OHRQoL of patients undergoing orthodontic treatment, and to investigate the relationship between these factors. The null hypothesis of this study was that there was no relationship between patient satisfaction, quality of life, and dental anxiety and fear.

METHODS

Ethical Approval

Approval was obtained from Sivas Cumhuriyet University Clinical Research Ethics Committee for the study with the written and oral consent of the patients and their parents. (Ethics Committee decision no: 2018-12/15)

Study Group

The study was conducted in the Department of Orthodontics, Sivas Cumhuriyet University Faculty of Dentistry. The sample was selected using the convenience sampling method. This cross-sectional study included 252 patients who were 11-14 years of age, undergoing orthodontic treatment at the orthodontic clinic of the faculty of dentistry. The patients included in the study were treated by orthodontists (G.E and Z.Ç.B) who were educated at the same university clinic, had the same experience, and were found to have a good relationship with the patients. The orthodontists participating in the study were calibrated before the study. At the beginning of treatment, patients were given the same directives and directions by the orthodontists. We collected data from January 2019 to October 2019. In this study, the minimum sample size calculated was 252 persons, considering a level of significance of 5%, test power of 90%, and minimum detectable odds ratio of 1 : 5.[20] The average quality of life scores in the sample article were used to calculate the effect size.

Individuals without any mental disorders were included in the study. The presence or absence of a mental disorder was determined by expert consultation. Patients with any syndrome were excluded from the study. Patients who received extracted, non-extracted or removable-fixed treatment type were included. Single-arch (Tanzo Cu-Niti, American Orthodontics, USA), MBT .022" bracket system (Mini Master American Orthodontics, USA), and MBT system space-closing technique (extracted cases) were used in all patients receiving fixed orthodontic treatment.[21] Clark's[22] modified twin-block appliance was used as a functional appliance in all patients receiving the STROBE checklist.

Data Collection

All measurements were made during the treatment just before the control session, in a private room, and by the patient herself/himself. Parents were instructed to wait outside while only patients were taken into the private room.

Index of Dental Anxiety and Fear-4C+

This index was developed in 2010 to measure dental anxiety and fear in patients. The IDAF-4C+ has strong theoretical bases but is also practical enough for application in a variety of potential uses.[23] It consists of 4 components: cognitive, behavioral, emotional, and physiological. It contains 8 questions that can be answered through a 5-point Likert-type scale, ranging from strongly disagree (1 point) to strongly agree (5 points). The scores are collected and averaged, and if the average score is <1.5 no anxiety is indicated, average score of 1.5-2.5 indicates low anxiety, 2.5-3.5 indicates medium anxiety, and average score> 3.5 indicates high anxiety. The Turkish version of the index was developed in 2017, and its validity and reliability have been tested.[9] This index is appropriate for children aged 12 to 14.[9] It was determined before the start of the study that it could be applied to children 11-14 years of age, with a pilot study.

Clinical Examination Data Form

This form was used by the researcher to record sociodemographic data such as age, gender, the duration of treatment, and the type of treatment.

Patient Satisfaction Data Form

The patients were asked the following questions to assess satisfaction status (4-point scale): Are you satisfied with the service provided at the university? Are you satisfied with your dentist? Considering everything, how satisfied are you with the orthodontic treatment?

LITERATURE REVIEW

With the keyword "patient satisfaction," an 8-item question pool was created with general questions by examining various articles written in the field, from Google Scholar, PubMed databases and clinical experiences. Of the questions prepared for the content of the study, 3 were found suitable, based on the expert opinions of orthodontists. Concurrently, the focus group interview was conducted with 5 patients, and the comprehensibility of the questions in the questionnaire was evaluated. The final version of the questionnaire was applied to 20 patients who were not included in the study, at 2-week intervals. Cronbach's alpha, for the internal consistency of the patient data form, was found to be 0.744. Factor analysis was performed to measure the validity of the patient data form, and KMO was calculated to be 0.735 as a result of the test. One factor was determined as a result of the factor analysis and this factor was collected in 60.032 of the variance. The factor loading range of the items fulfilled the requirement to be greater than 0.30. These values have shown that the patient data form is valid and reliable.

Child Perceptions Questionnaire 11-14

The CPQ 11-14 was developed for children aged 11-14 years with dental, oral, and orofacial problems. The CPQ 11-14 was used for the assessment of OHRQoL. The scale consists of 39 questions, including 2 general questions on oral health and its impact on life, and 37 questions on 4 subjects. The first 2 general questions assess the child's perception of his/her oral health and its impact on his/her life. Thirty-seven questions in the scale are about the frequency of events and emotions experienced by the child in the previous 3 months due to conditions associated with the teeth, lips, and jaws. These questions include oral symptoms (6 questions), functional limitations (9 questions), emotional well-being (9 questions), and social well-being (13 questions), respectively. The scale has a Likert-type structure, and the response options are as follows: 0 = never, 1 = once or twice, 2 = sometimes, 3 = often, and 4 = every day or almost every day. The total score obtained from the scale is calculated by adding all the points across the 37 questions. The higher the score, the worse the quality of life due to oral health.[17] The validity and reliability of the scale were published in 2002 by Jokovic et al.[17] The Turkish version of the CPQ 11-14 scale was prepared by Aydoğan within the scope of the thesis study, and showed sufficient evidence for validity and reliability.[24]

Statistical Analysis

The data collected from our study were analyzed using the SPSS program (Version 15.0, IBM Corp. New York, USA). The compatibility of the numerical data with the normal distribution was evaluated by the analysis of the skewness and kurtosis coefficients. Huck[25] states that the skewness and kurtosis values should vary between −1 and +1 in order to show the normal distribution of the data. Mean, standard deviation, and frequency distributions were studied in the data evaluation. Cronbach's alpha internal consistency coefficients of the CPQ subscales were calculated. The repeated-measures analysis of variance (ANOVA) test was used to determine whether there were significant differences between these 4 scores. The relationship between gender and IDAF and OHRQoL was evaluated by the independent samples *t*-test, and the relationship of IDAF and OHRQoL to the duration of treatment, the type of treatment, and the satisfaction status was evaluated by the ANOVA test. The correlation between the IDAF and OHRQoL scores was calculated using the Pearson correlation coefficient. Inter operator comparisons were made using independent samples *t*-test.

RESULTS

The questionnaires were applied to a total of 270 individuals, out of whom 18 were excluded because their answers were incomplete. Female participants comprised 62.3% (157), while 37.7% (95) were male. The mean age was found to be 13.18 years.

The results of the reliability analysis of the CPQ 11-14 scale used in our study were calculated for oral symptoms, functional limitations, emotional well-being, and social well-being, respectively. Cronbach's alpha coefficients for internal consistency of these parameters were 0.621, 0.769, 0.892, and 0.805, respectively. These data show that the parameter values have sufficient reliability. Reliability analysis of the CPQ 11-14 was undertaken for all participants.

The relationship and difference between IDAF and OHRQoL and gender, the duration of treatment, the type of treatment, and satisfaction status are given in Table 1. Female patients had higher OHRQoL scores than male patients ($P = .495$, $P > .05$). These results showed that males' quality of life was better than

Table 1. Assessment of the relationship between variables and dental anxiety and fear levels, and oral health-related quality of life

Variables	*N*	IDAF 4C+ (Mean ± SD)	CPQ 11-14			
			Oral symptom (Mean ± SD)	Functional limitations (Mean ± SD)	Emotional well-being (Mean ± SD)	Social well-being (Mean ± SD)
Gender						
Female	157	1.41 ± 0.56	1.50 ± 0.71	1.30 ± 0.70	0.90 ± 0.82	1.06 ± 0.82
Male	95	1.42 ± 0.60	1.42 ± 0.62	1.23 ± 0.66	0.79 ± 0.72	1.01 ± 0.70
P		0.802[a]	0.342[a]	0.429[a]	0.265[a]	0.643[a]
Duration of treatment						
1-6 months	110	1.43 ± 0.60	1.42 ± 0.70	1.31 ± 0.74	0.90 ± 0.87	1.08 ± 0.90
6-12 months	33	1.38 ± 0.49	1.33 ± 0.84	1.12 ± 0.67	0.66 ± 0.50	0.91 ± 0.67
12-24 months	40	1.38 ± 0.45	1.53 ± 0.59	1.28 ± 0.69	0.93 ± 0.76	1.11 ± 0.72
24 months and more	69	1.42 ± 0.63	1.57 ± 0.58	1.30 ± 0.60	0.85 ± 0.77	0.99 ± 0.63
P		0.961[b]	0.274[b]	0.586[b]	0.460[b]	0.585[b]
Type of treatment						
Extracted fixed	76	1.36 ± 0.44	1.51 ± 0.61	1.30 ± 0.70	0.75 ± 0.74	1.00 ± 0.73
Non-extracted fixed	80	1.41 ± 0.67	1.40 ± 0.57	1.22 ± 0.58	0.70 ± 0.71	0.90 ± 0.69
Removable/ fixed	96	1.45 ± 0.57	1.50 ± 0.80	1.30 ± 0.76	1.07 ± 0.84	1.19 ± 0.85
P		0.557[b]	0.499[b]	0.703[b]	0.003*	0.047*
Initiation of treatment						
Voluntarily	235	1.40 ± 0.57	1.48 ± 0.68	1.27 ± 0.68	0.83 ± 0.77	1.00 ± 0.73
With advice	17	1.61 ± 0.52	1.38 ± 0.68	1.43 ± 0.82	1.30 ± 0.93	1.57 ± 1.09
P		0.139[a]	0.568[a]	0.361[a]	0.016[c]	0.003[c]
University satisfaction						
Not satisfied	3	1.91 ± 0.87	0.88 ± 0.67	1.25 ± 0.33	0.92 ± 0.84	0.77 ± 0.22
Slightly satisfied	10	1.85 ± 1.05	1.76 ± 0.73	1.57 ± 0.94	1.08 ± 1.10	1.25 ± 0.97
Moderately satisfied	72	1.45 ± 0.54	1.60 ± 0.51	1.40 ± 0.67	1.02 ± 0.81	1.14 ± 0.76
Very satisfied	167	1.36 ± 0.53	1.40 ± 0.72	1.21 ± 0.67	0.77 ± 0.75	0.99 ± 0.77
P		0.022*	0.039*	0.121[b]	0.112[b]	0.393[b]
Dentist satisfaction						
Not satisfied	1	2.75	0.5	0.88	1.66	1
Slightly satisfied	2	2.06 ± 0.97	1.33 ± 0.00	0.94 ± 0.78	0.94 ± 0.54	1.44 ± 1.09
Moderately satisfied	15	1.44 ± 0.48	1.85 ± 0.45	1.61 ± 0.59	1.35 ± 1.02	1.57 ± 0.73
Very satisfied	234	1.40 ± 0.57	1.45 ± 0.68	1.26 ± 0.69	0.82 ± 0.76	1.00 ± 0.77
P		0.046*	0.072[b]	0.223[b]	0.061[b]	0.047
Treatment satisfaction						
Not satisfied	1	3.87	3	3.55	3.22	2.66
Slightly satisfied	9	1.62 ± 0.66	1.20 ± 0.49	1.32 ± 0.40	1.37 ± 0.82	1.50 ± 1.04
Moderately satisfied	98	1.48 ± 0.50	1.61 ± 0.71	1.39 ± 0.71	1.09 ±0.86	1.23 ± 0.84
Very satisfied	144	1.33 ± 0.57	1.38 ± 0.64	1.18 ± 0.65	0.65 ± 0.64	0.87 ± 0.65
P		0.000*	0.004*	0.001*	0.000*	0.000*

[a]$P > .05$ independent samples *t*-test, [b]$P > .05$ one-way ANOVA, [c]$P < .05$ independent samples *t*-test.
*$P < .05$ one-way ANOVA.
IDAF 4C+, Index of Dental Anxiety and Fear.
CPQ 11-14, Child Perceptions Questionnaire.

that of females. When the duration of treatment was examined, different IDAF and OHRQoL scores were determined in patients in different treatment periods. Lower scores mean less dental anxiety and better quality of life. Significant differences were found between the type of treatment and the initiation of treatment, and emotional well-being and social well-being ($P < .05$). Significant differences were found between satisfaction with the service provided at the university and IDAF and oral symptoms

($P < .05$). A significant difference was observed between dentist satisfaction and IDAF and social well-being ($P < .05$). The relationship between treatment satisfaction and all parameters was also significant ($P < .05$).

When we examined the data on patient satisfaction, we observed that 66.3% of the patients were quite satisfied with the service provided at the university. The patients' rate of satisfaction with dentists was very high, at 92.9%. Satisfaction with orthodontic treatment was 57.1%.

The descriptive statistics from the CPQ 11-14 of the participants ($n = 252$) were $1.47 \pm .68$, $1.28 \pm .69$, $0.86 \pm .79$, and $1.04 \pm .77$ for oral symptoms, functional limitations, emotional well-being, and social well-being, respectively. The data suggested that the most frequently encountered problems were related to oral symptoms, functional limitations, social well-being, and emotional well-being. The repeated-measures ANOVA test was used to determine whether the differences between these 4 scores were significant. The analysis showed a significant difference between the groups ($P < .05$).

When we examined the correlation between dental anxiety and fear scores and the CPQ subscales, there was no significant relationship between IDAF and oral symptoms, as the significance value calculated for the Pearson correlation coefficient between IDAF and oral symptoms was $P > .05$. Pearson's correlation coefficient between the other parameters and IDAF scores was calculated as $P < .05$, suggesting a significant relationship between the other parameters and IDAF. Pearson's correlation coefficient and P values calculated for these parameters are given in Table 2.

The patients included in the study were treated by 2 different orthodontists. There was no significant difference between orthodontists in patient satisfaction, quality of life, and dental anxiety scores ($P > .05$).

DISCUSSION

In our study, the number of females (62.3%) was higher than the number of males, similar to earlier studies.[15,26] A possible explanation may be that girls attach more importance to their physical appearance than boys, and therefore, are more likely to seek orthodontic treatment. Moreover, female participants reported a higher impact on OHRQoL scores due to treatment than males. Thus, female patients complained about their facial appearance and also believed that the treatment received negatively impacted their lives.

IDAF was lower in females than in males, but this was not statistically significant ($P > .05$), a finding that does not corroborate with the results of previous studies.[27,28] Buldur et al.[9] showed that females had higher anxiety scores than males. Another study demonstrated that dental fear status was influenced by parental dental fear, regardless of age and gender.[29] The reason girls' anxiety levels were lower than boys in our study may be that girls pay more attention to their appearance. At the same time, these outcomes may have been affected by differences in the dental anxiety of parents and sociodemographic factors.

Anxiety can be influenced by a variety of factors. For example, Jamali et al.[30] found a relation between daily media consumption and anxiety. However, anxiety levels must be supervised over longer treatment times and with more complex treatments in order to better understand children's behavior.[30] Increases in treatment time have been related to worsening behavior and anxiety in pediatric patients, according to the literature.[31] Choi et al.[32] reported that the quality of life deteriorated with an increase in treatment time. In one study, lower fears were reported in patients whose treatment was continued compared to patients whose treatment had not yet been initiated.[5] This demonstrates that fear decreases as the treatment progresses. No significant relationship was found between the duration of treatment and IDAF and OHRQoL in our study, unlike these studies. The patient–dentist relationship, the patient's personality traits, or various socioeconomic factors can all be cited as reasons for this circumstance. Future research will be required to determine which factors are effective.

The dental fear levels in patients receiving invasive and orthodontic treatment are higher than in those receiving invasive therapy only and in those who have no experience of treatment.[33] We analyzed the relationship between the type of treatment and anxiety levels and OHRQoL in patients who received extraction-fixed, non-extraction-fixed, and removable-fixed treatment. We believed that the different experiences in all 3 groups would influence IDAF and OHRQoL. We found that the highest anxiety levels were associated with the removable-fixed treatment, while the anxiety levels were lower than expected

Table 2. Correlation between dental anxiety and fear scores and CPQ 11-14

Variables	Oral symptoms	Functional limitations	Emotional well-being	Social well-being	IDAF 4C+
Oral symptoms	-	.524*	.305*	.261*	.075
Functional limitations		-	.478*	454*	.222*
Emotional well-being			-	.642*	.370*
Social well-being				-	.275*
IDAF 4C+					-

*Pearson correlation ratio.
IDAF 4C+, Index of Dental Anxiety and Fear.
CPQ 11-14, Child Perceptions Questionnaire.

in patients who received the extraction-fixed treatment. A possible reason may be that the extraction was not performed by the orthodontist, as recommended in the literature.[33] Unlike our findings, Mustafa et al.[4] reported that extraction was the common cause of fear among patients. The highest anxiety levels observed in patients who received the removable-fixed treatment could be attributed to the patient–dentist relationship that plays a crucial role in this type of treatment. Data from the literature show that establishing a good patient–dentist relationship from the first visit positively affects patient compliance and cooperation.[34] The issue of cooperation in removable appliances has been the subject of various studies.[35,36] Parental attitudes and the doctor–patient relationship, according to Mirzakouchaki et al.,[37] have a significant impact on patient compliance. Patient compliance in treatment with removable appliances is beyond the control of the orthodontist.[37] We believe that the doctor–patient relationship may be negatively affected by the lack of cooperation, which may cause dental anxiety. In one research, patients with increased overjet had a poorer quality of life.[38] Orthodontic appliances, especially fixed ones, cause more difficulties while eating, according to Albaqami et al.[39] Eating difficulties were investigated in the study of Albaqami et al.,[39] and it was discovered that there were no difficulties because removable appliances can be removed while eating. Other conditions that may have an impact on daily life were also evaluated in our study. The use of removable orthodontic appliances was found to have a negative impact on the quality of life. The explanation for this situation was that the usage time of the removable appliances was long and the large volume covers the mouth.

Dental fear can be affected by the personality traits of the patient, which play an essential role in determining the level of social influences on behavior.[29] Psychological approaches are effective in increasing orthodontic treatment motivation, according to a study.[40] Patients wanted orthodontic treatment because it improved their self-esteem, according to another study.[41] Self-esteem has been reported to be effective against dental fear.[42] Banarjee et al.[43] reported that patient motivation improved the quality of life. In our study, we asked the patients if they had initiated the treatment voluntarily or because they were advised to. Higher IDAF and OHRQoL scores were observed in patients who sought treatment because they were advised to. These data show that patients who volunteered to receive treatment demonstrated better results in terms of dental anxiety and quality of life.

The process of patient management is as important as the outcome of treatment. Thus, it is essential to evaluate every stage of treatment from the patient's viewpoint and measure satisfaction to provide the best possible results.[44] Therefore, we assessed the level of satisfaction and found that the rate of dentist satisfaction strongly correlated with the dentist–patient relationship (92.9%). Our study showed higher IDAF scores in patients who were dissatisfied or less than satisfied with their dentist. Dental fear is known to affect patient cooperation and treatment success.[34] Successful orthodontic treatment is highly dependent on a positive patient–dentist relationship. Shahrani et al.[45] reported that 87.1% of patients were satisfied with orthodontic treatment, and the patient–dentist relationship was an important factor affecting satisfaction. A study by Aljughaiman et al.[26] revealed that the patient–dentist relationship received the highest satisfaction scores among participants in their study. Our results are in agreement with the findings of these studies, which have suggested that an association exists between the patient–dentist relationship, dental fear levels, and treatment success.

There is no doubt that there is a difference between the healthcare services provided in private or public institutions in terms of patient satisfaction. The quality of healthcare service affects patient satisfaction.[46] A study showed that patients were more likely to be satisfied with services received in public institutions.[26] Our study conducted showed a patient satisfaction level of 66.3%. A high level of IDAF was observed in patients who were not satisfied with the service received.

Patients who received orthognathic surgery were satisfied with the treatment and showed improved OHRQoL scores.[47] In patients treated with conventional brackets or the Invisalign system, post-treatment satisfaction and OHRQoL scores exhibited a positive change.[48,49] Studies show that patient satisfaction positively impacts the quality of life.[15,47,49] Our study suggested that the patients who were satisfied with the treatment experienced less anxiety and showed improved quality of life.

Dental anxiety negatively influenced oral health. High dental anxiety was associated with a low number of dental fillings and a high calculus index. A decline in oral health negatively impacts the quality of life.[50] Dental fear may decrease a child's OHRQoL scores, especially those for emotional and social well-being. Positive small treatment experiences may reduce this effect.[51] A significant relationship was found between OHRQoL and the socioeconomic status of the parent, dental anxiety, and oral health behaviors.[19] These data in the literature support our study, which showed a significant correlation between IDAF and OHRQoL scores, and a moderate correlation between IDAF and emotional well-being.

Our study was performed in a single clinic with a cross-sectional design. It would be more appropriate to conduct it in more than one clinic and with a prospective design. The strength of the study is the examination of the relationship of 3 different variables that are clinically important.

CONCLUSION

- Dental anxiety has an impact on the OHRQoL.
- Worse OHRQoL was observed in the removable-fixed treatment type. At the same time, higher dental anxiety was detected in this type of treatment. It may be beneficial for orthodontists to be more careful with this type of treatment.
- A positive patient–dentist relationship was characterized by low dental anxiety levels and better OHRQoL.

Ethics Committee Approval: Ethical committee approval was received from the Clinical Research Ethics Committee of Sivas Cumhuriyet University (decision no: 2018-12/15).

Informed Consent: Written and verbal consent was obtained from the patients and their parents.

Peer Review: Externally peer-reviewed.

Author Contributions: Concept - Z.Ç.B.; Design - Z.Ç.B.; Supervision - C.D.; Resources – Z.Ç.B; Materials - Z.Ç.B.; Data Collection and/or Processing - Z.Ç.B.; Analysis and/or Interpretation - Z.Ç.B., C.D.; Literature Review - Z.Ç.B.; Writing - Z.Ç.B; Critical Review - Z.Ç.B., C.D.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Asl AN, Shokravi M, Jamali Z, Shirazi S. Barriers and drawbacks of the assessment of dental fear, dental anxiety and dental phobia in children: A critical literature review. *J Clin Pediatr Dent*. 2017;41(6):399-423. [CrossRef]
2. Kilinç G, Akay A, Eden E, Sevinç N, Ellidokuz H. Evaluation of children's dental anxiety levels at a kindergarten and at a dental clinic. *Braz Oral Res*. 2016;30(1):e72. [CrossRef]
3. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *Int J Paediatr Dent*. 2007;17(6):391-406. [CrossRef]
4. Mustafa S, Younis R, Islam H, Durrani O. Dental fear in patients pursuing orthodontic treatment. *Pak Orthod J*. 2017;9:37-42.
5. Roy J, Dempster LJ, eds. Dental anxiety associated with orthodontic care: prevalence and contributing factors. *Semin Orthod*. Elsevier. 2018;24(2):233-241. [CrossRef]
6. Yildirim TT. Evaluating the relationship of dental fear with dental health status and awareness. *J Clin Diagn Res*. 2016;10(7):ZC105-ZC109. [CrossRef]
7. Quteish Taani DS. D. Dental anxiety and regularity of dental attendance in younger adults. *J Oral Rehabil*. 2002;29(6):604-608. [CrossRef]
8. Abrahamsson KH, Berggren U, Hakeberg M, Carlsson SG. The importance of dental beliefs for the outcome of dental-fear treatment. *Eur J Oral Sci*. 2003;111(2):99-105. [CrossRef]
9. Buldur B, Armfield JM. Development of the Turkish version of the Index of Dental Anxiety and Fear (IDAF-4C+): dental anxiety and concomitant factors in pediatric dental patients. *J Clin Pediatr Dent*. 2018;42(4):279-286. [CrossRef]
10. Lee R, Hwang S, Lim H, et al. Treatment satisfaction and its influencing factors among adult orthodontic patients. *Am J Orthod Dentofacial Orthop*. 2018;153(6):808-817. [CrossRef]
11. Tausche E, Luck O, Harzer W. Prevalence of malocclusion in the early mixed dentition and orthodontic treatment need. *Am J Orthod Dentofac Orthop*. 2005;26:394. [CrossRef]
12. Al-Omiri MK, Abu Alhaija ES. Factors affecting patient satisfaction after orthodontic treatment. *Angle Orthod*. 2006;76(3):422-431. [CrossRef]
13. Anderson LE, Arruda A, Inglehart MR. Adolescent patients' treatment motivation and satisfaction with orthodontic treatment: do possible selves matter? *Angle Orthod*. 2009;79(5):821-827. [CrossRef]
14. Bos A, Vosselman N, Hoogstraten J, Prahl-Andersen B. Patient compliance: a determinant of patient satisfaction? *Angle Orthod*. 2005;75(4):526-531. [CrossRef]
15. Pacheco-Pereira C, Brandelli J, Flores-Mir C. Patient satisfaction and quality of life changes after Invisalign treatment. *Am J Orthod Dentofacial Orthop*. 2018;153(6):834-841. [CrossRef]
16. Fernandes MJ, Ruta DA, Ogden GR, Pitts NB, Ogston SA. Assessing oral health-related quality of life in general dental practice in Scotland: validation of the OHIP-14. *Commun Dent Oral Epidemiol*. 2006;34(1):53-62. [CrossRef]
17. Jokovic A, Locker D, Stephens M, et al. Validity and reliability of a questionnaire for measuring child Oral-Health-related quality of life. *J Dent Res*. 2002;81(7):459-463. [CrossRef]
18. Utomi I. *Challenges and Motivating Factors of Treatment among Orthodontic Patients*; 2007.
19. Buldur B, Güvendi ON. Conceptual modelling of the factors affecting oral health-related quality of life in children: A path analysis. *Int J Paediatr Dent*. 2019;30(2):181-192. [CrossRef]
20. Dos Santos PR, Meneghim MdC, Ambrosano GM, Vedovello Filho M, Vedovello SA. Influence of quality of life, self-perception, and self-esteem on orthodontic treatment need. *Am J Orthod Dentofac Orthop*. 2017;151:143-147. [CrossRef]
21. Babanouri N, Ajami S, Salehi P. Effect of mini-screw-facilitated micro-osteoperforation on the rate of orthodontic tooth movement: a single-center, split-mouth, randomized, controlled trial. *Prog Orthod*. 2020;21(1):7. [CrossRef]
22. Clark W, Clark WJ. *Twin Block Functional Therapy*. JP Medical Ltd; 2014.
23. Armfield JM. Development and psychometric evaluation of the Index of Dental Anxiety and Fear (IDAF-4C+). *Psychol Assess*. 2010;22(2):279-287. [CrossRef]
24. Aydoğan C, Kazancı F. Erken adölesan (11-14 yaş) dönemdekİ çocuklarda ağiz sağliğina bağli yaşam kalİtesİnİn ölçülmesİnde kullanilabİlecek ölçekler. *Atatürk Univ Diş Hekimliği Fak Derg*. 2009;25(1):408-414. [CrossRef]
25. Huck S. Huck SW, ed. *Reading Statistics and Research*. 6th ed. Boston, MA: Pearson; 2012:276-311.
26. Aljughaiman A, Alshammari A, Althumairi A, et al. Patient satisfaction with orthodontic treatment received in public and private hospitals in Dammam, Saudi Arabia. *Open Access Maced J Med Sci*. 2018;6(8):1492-1497. [CrossRef]
27. Abu-Ghazaleh SB, Rajab LD, Sonbol HN, et al. The Arabic version of the modified dental anxiety scale. Psychometrics and normative data for 15-16 year olds. *Saudi Med J*. 2011;32(7):725-729.
28. Shaikh MA, Kamal A. Over dental anxiety problems among university students: perspective from Pakistan. *J Coll Physicians Surg Pak*. 2011;21(4):237-238. [CrossRef]
29. D'Alessandro G, Alkhamis N, Mattarozzi K, Mazzetti M, Piana G. Fear of dental pain in I talian children: child personality traits and parental dental fear. *J Public Health Dent*. 2016;76(3):179-183. [CrossRef]
30. Jamali Z, Vatandoost M, Erfanparast L, Aminabadi NA, Shirazi S. The relationship between children's media habits and their anxiety and behaviour during dental treatment. *Acta Odontol Scand*. 2018;76(3):161-168. [CrossRef]
31. Jamali Z, Najafpour E, Ebrahim Adhami Z, et al. Does the length of dental procedure influence children's behavior during and after treatment? A systematic review and critical appraisal. *J Dent Res Dent Clin Dent Prospects*. 2018;12(1):68-76. [CrossRef]
32. Choi SH, Cha JY, Lee KJ, Yu HS, Hwang CJ. Changes in psychological health, subjective food intake ability and oral health-related quality of life during orthodontic treatment. *J Oral Rehabil*. 2017;44(11):860-869. [CrossRef]
33. Rantavuori K, Sihvonen A, Tolvanen M, Lahti S. The significance of previous invasive and orthodontic treatment experiences on children's dental fear. *Eur J Orthod*. 2014;36(4):409-413. [CrossRef]
34. Bos A, Hoogstraten J, Prahl-Andersen B. Towards a comprehensive model for the study of compliance in orthodontics. *Eur J Orthod*. 2005;27(3):296-301. [CrossRef]
35. Sarul M, Lewandowska B, Kawala B, Kozanecka A, Antoszewska-Smith J. Objectively measured patient cooperation during early orthodontic treatment: does psychology have an impact? *Adv Clin Exp Med*. 2017;26(8):1245-1251. [CrossRef]
36. von Bremen J, Lorenz N, Ludwig B, Ruf S. Increased BMI in children-an indicator for less compliance during orthodontic treatment with removable appliances. *Eur J Orthod*. 2018;40(4):350-355. [CrossRef]
37. Mirzakouchaki B, Shirazi S, Sharghi R, Shirazi S. Assessment of factors affecting adolescent patients' compliance with Hawley and

vacuum formed retainers. *J Clin Diagn Res*. 2016;10(6):ZC24-ZC27. [CrossRef]
38. Kallunki J, Sollenius O, Paulsson L, et al. Oral Health-related quality of life among children with excessive overjet or unilateral posterior crossbite with functional shift compared to children with no or mild orthodontic treatment need. *Eur J Orthod*. 2019;41(2):111-116. [CrossRef]
39. Albaqami G, Abreu LG, Bernabé E. Is wearing orthodontic appliances associated with eating difficulties and sugar intake among British adolescents? A cross-sectional study. *Eur J Orthod*. 2021;43(2):193-199. [CrossRef]
40. Karasiunok AY, Smahliuk LV. The role of parents in motivation for orthodontic treatment for children. *Wiad Lek*. 2018;71(3 pt 1):529-533.
41. Mahajan M. Evaluation of different motivational factors for seeking orthodontic treatment: the patients' and parents' response. *J Dent Allied Sci*. 2018;7:55.
42. Vigu A, Stanciu D. When the fear of dentist is relevant for more than one's oral health. A structural equation model of dental fear, self-esteem, Oral-Health-related well-being, and general well-being. *Patient Preference Adherence*. 2019;13:1229-1240. [CrossRef]
43. Banerjee S, Banerjee R, Shenoy U, Agarkar S, Bhattacharya S. Effect of orthodontic pain on quality of life of patients undergoing orthodontic treatment. *Indian J Dent Res*. 2018;29(1):4-9. [CrossRef]
44. *Health SoSf. High Quality Care for All: NHS Next Stage Review Final Report*. The Stationery Office; 2008.
45. Shahrani IA, Tikare S, Togoo RA, et al. Patient's satisfaction with orthodontic treatment at King Khalid University, College of Dentistry, Saudi Arabia. *Bangladesh J Med Sci*. 2015;14(2):146-150. [CrossRef]
46. Naidu A. Factors affecting patient satisfaction and healthcare quality. *Int J Health Care Qual Assur*. 2009;22(4):366-381. [CrossRef]
47. Schilbred Eriksen ES, Moen K, Wisth PJ, Løes S, Klock KS. Patient satisfaction and oral health-related quality of life 10-15 years after orthodontic-surgical treatment of mandibular prognathism. *Int J Oral Maxillofac Surg*. 2018;47(8):1015-1021. [CrossRef]
48. Azaripour A, Weusmann J, Mahmoodi B, et al. Braces versus Invisalign®: gingival parameters and patients' satisfaction during treatment: a cross-sectional study. *BMC Oral Health*. 2015;15:69. [CrossRef]
49. Flores-Mir C, Brandelli J, Pacheco-Pereira C. Patient satisfaction and quality of life status after 2 treatment modalities: Invisalign and conventional fixed appliances. *Am J Orthod Dentofacial Orthop*. 2018;154(5):639-644. [CrossRef]
50. Kanaffa-Kilijanska U, Kaczmarek U, Kilijanska B, Frydecka D. Oral Health condition and hygiene habits among adult patients with respect to their level of dental anxiety. *Oral Health Prev Dent*. 2014;12(3):233-239. [CrossRef]
51. Luoto A, Lahti S, NEVANPERÄ T, Tolvanen M, Locker D. Oral-Health-related quality of life among children with and without dental fear. *Int J Paediatr Dent*. 2009;19(2):115-120. [CrossRef]