

Assessment of the anxiety levels of orthodontic patients during the COVID-19 pandemic

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Abstract

Aim: This study aims to determine the anxiety levels of orthodontic patients related to the coronavirus pandemic and to evaluate the effects of quarantine on orthodontic appointments and orthodontic treatment.

Methodology: This cross-sectional study was conducted as an online survey with the participation of patients who were actively receiving orthodontic treatment. A total of 281 orthodontic patients (191 [67.97%] females and 90 [32.03%] males) participated in the survey. The questionnaire consisted of five sections that included questions about demographics, the COVID-19 pandemic, and the patients' orthodontic status. Anxiety levels were measured using Turkish versions of the Beck Anxiety Inventory and the Corah's Dental Anxiety Scale. Descriptive statistics, the Kolmogorov-Smirnov and Shapiro-Wilk normality tests, the Pearson correlation test, and the Mann Whitney U test were used for statistical analysis.

Results: Regarding patients' perceptions of the pandemic, 251 patients (89.32%) reported that they were sufficiently informed about COVID-19. The main concern about the effects of quarantine on orthodontic treatment was the delay of orthodontic treatment at a rate of 58.36% (164/281). This study found that 36% (103/281) of the participants exhibited anxiety symptoms. The prevalence of dental anxiety specifically was 33% (95/281). Our study results reveal a significant relationship between dental anxiety and general anxiety, which indicates that dentally anxious people tend to also be generally anxious. Females had significantly higher anxiety levels than males ($p < 0.001$).

Conclusion: The coronavirus pandemic and quarantine seem to impact orthodontic patients' anxiety. Delay of treatment was the primary concern of patients during the COVID-19 pandemic. Female patients were more anxious than males.

Keywords: COVID-19, orthodontics, dental anxiety, Beck Anxiety Inventory, Dental Anxiety Scale, psychological stress

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first emerged in Wuhan, China in December 2019. It was declared a pandemic worldwide by the World Health Organization on March

11, 2020. Although most people infected with SARS-CoV-2 manifest mild to moderate symptoms without the need for treatment, it can have more severe consequences for individuals in high-risk groups (e.g., those of advanced age or suffering from systemic conditions) (1).

COVID-19 is mainly transmitted via respiratory droplets and contact. The droplets emitted by sick individuals through coughing and sneezing are transferred to others when they touch their mouth, nose, or eye mucosa after contact with contaminated subjects. In addition, asymptomatic people and patients in the incubation period play an essential role in spreading the virus (2). Other means of transmission of coronaviruses, such as contact with contaminated fomites produced during aerosol-forming processes and inhalation of aerosols, have been demonstrated. Coronaviruses in general are not very resistant to the outer environment. The endurance interval depends on various factors, such as temperature and humidity, the quantity of expelled organic matter, and the consistency of the contaminated surface (3). A study reported that SARS-CoV-2 is suspended in aerosols for at least three hours, and the virus continued its activity for up to four hours on copper surfaces, up to one day (24 hours) on cardboard, and up to three days on plastic and stainless steel (4).

Following the emergence of the first COVID-19 cases in Turkey, health and safety measures were prioritized, and education was suspended in all schools and universities. Various infection control measures—such as travel restrictions; lockdown for specific age groups; and postponement of scientific, cultural, artistic, and similar meetings and activities—were implemented to control the pandemic and avoid further spread of the virus (5).

Given that SARS-CoV-2 can quickly infect an individual via contact with secretions or aerosol inhalation, dental practices require great attention to two aspects: intense aerosol-generating hand tools and close-range work in an enclosed area. During the pandemic, only emergency and mandatory procedures could be performed in line with the recommendations of the Ministry of Health Scientific Committee (6). Throughout the quarantine period, after the closure of orthodontics clinics, except for emergencies, all routine orthodontic procedures were interrupted and negatively affected patients' orthodontic treatment progress. Protective measures in dental clinical practice are not effective enough to prevent transmission of COVID-19 due to the possibility of having patients in the incubation period, unaware that they are infected, or hiding their disease (7).

Studies on the psychological and social effects of COVID-19 have also revealed that this disease has caused radical changes in the living conditions of many societies and is associated with adverse psychological outcomes (8). It has been reported that psychological problems, including anxiety, depression, and stress, increase during epidemics (9). Fears of being unable to access healthcare, food shortages, and being infected at any moment have produced significant psychological effects. The emergence of new cases, deaths during the pandemic, and the information magnified by mass media coverage also raise societal anxiety. Therefore, studies show that quarantine implementation significantly increases anxiety (10). Social isolation associated with restrictive measures, feelings of uncertainty about the future, and fear of new and

unknown infectious agents cause abnormally elevated anxiety (11). Even some measures taken for dental practice during the COVID-19 pandemic—such as epidemiological record evaluation, temperature control, and improved personal protective measures—may cause an increase in patient anxiety (12). There are many reports in the literature examining the psychological effects of the COVID-19 pandemic on society, patients, children and adolescents, healthcare professionals, dentists, and students (13-18).

This study aims to determine the anxiety levels of orthodontic patients related to the coronavirus pandemic and to evaluate the effects of quarantine on orthodontic appointments and orthodontic treatment.

Materials and Methods

This study was approved by the Hamidiye Clinical Research Ethics Committee at the University of Health Sciences (08.01.2021 / E-46418926-050.01.04-2744). This study used an online survey of 281 patients currently receiving orthodontic treatment in the Orthodontic Clinic of the Hamidiye Faculty of Dentistry. Orthodontic patients responded to the questionnaire between February 2021 and March 2021. The participation was on a volunteer basis, and all participants were sent a consent form that followed the principles of the Helsinki Declaration. The survey was prepared using Google Form Questionnaire, and the link was sent to orthodontic patients via smartphones.

In addition to questions about demographic information, participants answered questions about their perceptions of the pandemic and their orthodontic state, and the Beck Anxiety Inventory and Corah's Dental Anxiety Scale were used to measure patient anxiety levels.

Beck Anxiety Inventory (BAI), developed by Beck et al. in 1988, is a self-report inventory that measures the frequency of anxiety symptoms experienced by a person (19). The scale consists of 21 items of four-point Likert type measurement (0 none, three serious) to evaluate how much a person is disturbed by the anxiety symptoms over the past week. The score range is between 0-63. Turkish validity and reliability were conducted by Ulusoy et al., and the internal reliability of Cronbach's alpha was found to be 0.93 (20).

Corah's Dental Anxiety Scale (DAS) consists of four multiple-choice questionnaires designed to evaluate the degree of anxiety related to dental treatment, with total scores ranging between 4 (no anxiety) and 20 (high anxiety) (21). We used the Turkish version of the Dental Anxiety Scale (22).

Statistical Analysis

Statistical analyses were conducted using the SPSS software version 21 (IBM SPSS Inc., Armonk, NY, USA). Descriptive statistics of the responses were performed. We applied Kolmogorov-Smirnov and the Shapiro-Wilk test to Dental Anxiety Scale and Beck Anxiety Inventory scores. Normality assumptions of DAS and BAI scores

were tested, it was found that the data was not normally distributed ($p < 0.05$). The mean anxiety levels and standard deviations (SD) were calculated. Mann-Whitney U test was used for differences between groups. Pearson correlation test was used to analyze the relationship between DAS scores and BAI scores, and internal consistencies for both scales were evaluated using Cronbach's alpha coefficient. Significance was set at $p < 0.05$.

Results

A total of 281 orthodontic patients (67,97% females and 32,03% males) participated in the survey. The mean age of the participants was 20 years with a standard deviation (SD) of 9 years. The participants were subdivided into under 20 years old, 21-30 years old, over 31 years old by age groups, and the distribution of the groups was calculated to be 212 (75,4%), 39 (13,9%), 30 (10,7%) respectively. The participants were evaluated in terms of education level, resulting in that 26 (9,25%) were in primary school, 88 (31,32%) were in middle school, 115 (40,93%) were in high school, and 52 (18,51%) were in university. Regarding patients' perception of the pandemic, 251 patients (89,32%) responded that they were informed enough about COVID-19. During the quarantine period 87,9% responded they didn't spend it alone. Only 8,54% of patients suffered from Covid-19, and the rate of those who do not encounter an infected Covid-19 person is 80.78%. Participant's rate who considered this disease as very severe is 50,53%, and the patient's main concerns about COVID-19 were the danger of disease (74,38%) and risk of infection of patient or his/her relatives 56,23%.

Regarding the patient's orthodontic status, 70,82% continued orthodontic treatment in orthodontic departments of university hospitals, and 89,32% responded that they had worn fixed appliances. The rate of patients who had an orthodontic appointment within 1-2 months was 41,99%, and 45,2% responded that their orthodontic treatment lasted for more than two years. The doctor gave information about the suspension of orthodontic treatment during the quarantine process to 245 (87,19%) patients, and 172

(61.21%) of patients were contacted more than three times by the doctor during quarantine. The main concern about how quarantine affects orthodontic treatment was delaying the end of orthodontic treatment 58.36%.

We evaluated the reliability of the anxiety scales used in this study. The Cronbach Alpha value of Corah's Dental Anxiety Scale was 0,752, and the alpha value of the Beck Anxiety Inventory score was 0,934.

Mean anxiety values and standard deviation (SD) are presented in table 1. The mean DAS score (\pm SD) was 6.94 (\pm 2.55), and the mean BAI score was 7.65 (\pm 9.21). The highest mean score of DAS was 7.14 of 20 years old and younger age group, and the highest mean score of the BAI was 10,5 of 31 years old and older age group. The mean DAS score and BAI score of females were 7.09 and 9,43, respectively. The mean DAS score and BAI score of males were 6.61 and 3.89.

The Pearson correlation coefficients between DAS and BAI scores are reported in Table 2. There was a significant correlation between DAS and BAI scores ($r = 0.193$, $p < 0.01$). As the BAI score increases, DAS score also increases.

Comparing the mean anxiety scores of DAS and BAI by gender (Table 3), it was determined that there is no statistically significant difference between genders in terms of DAS scores ($p > 0.05$). There is a statistically significant difference between genders in BAI scores ($p < 0.05$). BAI scores of men are significantly lower than women.

When comparing the DAS and BAI scores of women and men by the age groups (Table 4), there is a statistically significant difference between genders in terms of BAI scores in those aged 20 and under ($p < 0.05$). Women under 20 years of age have significantly higher BAI scores than men. There is a statistically significant difference between genders in terms of both DAS and BAI scores among the over 31 years old age group. The BAI score of women is significantly higher than men in 31 and over age group.

When comparing the mean anxiety scores of males and females via the educational status (Table 5), it was found that female BAI score was significantly higher than those of males in "high school" and "university" groups.

Table 1. Distribution of DAS and BAI scores

	n	Mean	Median	Min	Max	Sd
Corah's Dental Anxiety Scale Score	281	6,94	6	4	16	2,55
Beck Anxiety Inventory Score	281	7,65	5	0	52	9,21

Table 2. Pearson's correlation test of DAS and BAI scores

Dental Anxiety Scale score		
Beck Anxiety Inventory Score	r	0,193
	p	0,001
	n	281

Table 3. Mean DAS and BAI scores by gender

		Gender					Test result			
		n	Mean	Median	Min	Max	Sd	Mean Rank	z	p
Dental Anxiety Scale Score	Female	191	7,09	6	4	16	2,65	145,27	-1,297	0,195
	Male	90	6,61	6	4	15	2,31	131,93		
	Total	281	6,94	6	4	16	2,55			
Beck Anxiety Inventory Score	Female	191	9,43	6	0	52	10,02	158,18	-5,197	0,001
	Male	90	3,89	1	0	29	5,58	104,54		
	Total	281	7,65	5	0	52	9,21			

Mann Whitney U test, $p < 0,05$, n-sample size, SD= standard deviation

Table 4. Mean DAS and BAI scores of females and males by the age groups.

Age	Gender	n	Dental Anxiety Scale ($\bar{x} \pm SD$)	Beck Anxiety Inventory ($\bar{x} \pm SD$)
Under 20 years old	Female	141	7,27 \pm 2,73	8,87 \pm 9,24
	Male	71	6,89 \pm 2,26 z=-0,668; p=0,504	3,54 \pm 4,43 z=-4,191; p=0,001
21-30	Female	31	6,03 \pm 1,92	9,26 \pm 10,19
	Male	8	5,63 \pm 2,83 z=-1,158; p=0,247	5,88 \pm 11,05 z=-1,773; p=0,076
Over 31 years old	Female	19	7,53 \pm 2,72	13,84 \pm 14,12
	Male	11	5,55 \pm 1,86 z=-2,125; p=0,034	4,73 \pm 7,02 z=-2,238; p=0,025

Mann Whitney U test, $p < 0,05$, n-sample size, SD= standard deviation

Table 5. Mean DAS and BAI scores by educational status between female and male.

Education	Gender	n	Dental Anxiety Scale (x±SD)	Beck Anxiety Inventory (x±SD)
Primary school	Female	16	7,44±2,19	6,63±6,65
	Male	10	6,5±3,37	4,1±5,78
			z=-1,517; p=0,129	z=-0,643; p=0,52
Secondary school	Female	57	7,61±2,52	6,72±7,93
	Male	31	7,55±2,16	3±3,35
			z=-0,159; p= 0,874	z=-1,916; p=0,055
High school	Female	77	2,86±7,17	10,94±10,83
	Male	38	6,16±1,78	46,34
			z=-1,573; p=0,116	z=-4,245; p=0,001
University	Female	41	7,17±2,86	11,46±11,29
	Male	11	7,55±2,16	5,82±7,61
			z=-1,067; p=0,286	z=-2,049; p=0,04

Mann Whitney U test p<0,05, n-sample size, SD= standard deviation

Discussion

This cross-sectional study was applied almost one year since the first Covid-19 case was detected in Turkey. During this time, government and health authorities took plenty of measures to control the spread of the virus and lease its consequences, such as quarantine, social isolation, mass media awareness campaign, and vaccination campaign. All these measures caused the emergence of implications in mental health, such as stress, anxiety, depression, and uncertainty about the future (13).

This study aims to examine the anxiety levels of orthodontic patients related to the coronavirus pandemic and evaluate the effect of quarantine on orthodontic treatments.

A few studies in orthodontic literature have assessed the anxiety levels of patients during orthodontic treatment. Crowley et al. reported that orthodontic treatment-induced fear and anxiety (23). However, Breistein and Burden stated that anxiety about dental treatment did not appear to act as a significant barrier preventing individuals in need of treatment from entering orthodontic treatment (24). They explained this finding as orthodontic treatment was perceived as one of the least painful dental treatments. Lewis and Brown found that 25% of patients were anxious about wearing orthodontic appliances (25). Maj et al. reported that 77% of children had difficulty psychologically adjusting to orthodontic appliances (26).

In this study, it was found that 36% (103/281) of participants showed anxiety symptoms, and this result is following other previous studies (5,8,12). The prevalence of dental anxiety is 33% (95/281) and is higher than the results of other studies (22, 27-29), and this is related to the fact that this study was conducted during the Covid-19 pandemic. Our study results revealed a significant relationship between dental anxiety and general anxiety, which indicates that dentally anxious people tend to be also generally anxious.

The success of orthodontic treatment relies on the interaction between the patient and the orthodontist. The relationship between doctor and patient can positively affect treatment results by motivating the patient to cooperate with the following prescribed instructions regarding appliance wearing and oral hygiene maintenance. Also, active cooperation of the patient through the length of orthodontic treatment is required for a successful orthodontic treatment. Effective communication with the doctor can decrease patient anxiety, fear, and stress (30). Corah et al. reported that dentist's behaviors, specifically empathy, friendliness, and communicativeness, were related to anxiety reduction (31). A comfortable and warm doctor-patient interaction, technically competent and informative doctor is what patients expect from the dentist. When patients' expectancies are not encountered, they feel disappointed, less satisfied, fail to keep appointments, and do not comply with prescribed instructions. Consequently, the

psychological effect of a dissatisfied patient may lead to increased anxiety, reduction of patient compliance, and finally, a poor orthodontic result (30). Yıldırım et al. found that patient dental anxiety and state anxiety levels decrease after patients become familiar with their orthodontist and become accustomed to orthodontic treatment (32).

COVID-19 pandemic has created challenges in orthodontics that led to implementing new adaption in the clinical practice of orthodontics. These new adoptions include measures to control infection transmission, social distancing measures by redistributing spaces, decrease the number of patients, use of tele orthodontics, and use appliances and techniques that require less scheduled or urgent appointments. The use of personal protective equipment (PPE) by the doctor and clinical staff is very uncomfortable in everyday clinical activity and restricts psychological interaction with the patient, which is an essential tool in the treatment of children and adults (33). The PPE influences voice tone, making it difficult for the patient to understand what the dentist is communicating and prevent the reading of facial expressions, which are essential in building trust between patient-dentists and increasing patients' anxiety levels (34, 35).

In the present study, female participants number was two times higher than male participants, which means that females are more willing to seek orthodontic treatment (12). Most of the participants responded that they had enough information about Covid-19 and considered it a severe disease. This is a positive aspect because it means awareness among orthodontic patients about Covid-19 disease and measures that should be taken during orthodontic practice. Most patients responded that they had an orthodontic appointment within 1-2 months and were contacted more than three times by the doctor during quarantine. This indicates the close communication between patient-doctor that should exist during orthodontic treatment. Considering how quarantine affects orthodontic treatment, most patients responded as their primary concern the delay of the end of orthodontic treatment. Prolongation of orthodontic treatment duration might trigger anxiety among patients (12).

The present study determined that female participants showed a higher level of anxiety than male participants. This result is consistent with previous studies showing that women tend to be more psychologically affected by the pandemic (5, 8, 12). On the contrary, there was no statistically significant difference between genders in terms of dental anxiety. It was found that general anxiety levels were higher in women of age group under 20 years old. There is a statistically significant difference between genders in terms of both DAS and BAI scores among the over 31 years old age group. Both general anxiety levels and dental anxiety levels of women were higher than men in 31 years old age group. This finding could be related to the fact that women spend more time home during the outbreak, and house tasks and responsibilities are increased.

The limitation of this study is that we used self-reported questionnaires, a small sample, and the fact that the pandemic is still ongoing, and the anxiety levels may change over time.

Conclusions

The coronavirus pandemic and quarantine seem to impact orthodontic patients' anxiety. More than one-third of the patients experienced anxiety symptoms. Delay of treatment was the primary concern of patients during the Covid-19 pandemic, and female patients were more anxious than males.

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