IDR International Dental Research

Int Dent Res 2025; 15(1): 30-37
https://doi.org/10.5577/intdentres.575

Original Article Open Access

Psychosocial impact of COVID-19 among adolescent orthodontic patients: A multicenter cross-sectional study

Eyüp Burak Küçük[1], Serpil Çokakoğlu[2], Mehmet Hanifi Kokaçya[3], Mehmet Karadağ[4]

[1] Hatay Mustafa Kemal University, Faculty of Dentistry, Department of Orthodontics, Hatay, Türkiye
[2] Pamukkale University, Faculty of Dentistry, Department of Orthodontics, Denizli, Türkiye
[3] Hatay Mustafa Kemal University, Faculty of Medicine, Department of Psychiatry, Hatay, Türkiye
[4] Hatay Mustafa Kemal University, Faculty of Medicine, Department of Biostatistics, Hatay, Türkiye

Received: 20 February 2025
Accepted: 24 March 2025

Correspondence:
Dr. Serpil ÇOKAKOĞLU
Pamukkale University Faculty of Dentistry, Department of Orthodontics, Denizli, Türkiye.
E-mail: serpilcokakoglu@gmail.com

How to cite this article:
Küçük EB, Çokakoğlu S, Kokaçya MH, Karadağ M. Psychosocial impact of COVID-19 among adolescent orthodontic patients: A multicenter cross-sectional study. Int Dent Res. 2025;15(1):30-37.
https://doi.org/10.5577/intdentres.575

Abstract

Aim: The aim of this study was to assess the COVID-19 anxiety and fear levels of adolescent patients undergoing orthodontic treatment in terms of their demographic variables, treatment location, COVID-19 status, and various clinical conditions (hospitalization and psychological support), as well as to evaluate their associations with age and treatment duration.

Methodology: A multicenter descriptive and cross-sectional study was conducted in four different private clinics and a public hospital during the pandemic. Descriptive data included information on demographics, orthodontic treatment, and COVID-19 status. Anxiety and fear were assessed using the COVID-19 Anxiety Scale (CAS) and Fear of COVID-19 Scale (FC-19S), respectively. The collected data was statistically analyzed with the Shapiro-Wilk, Student's t, Mann-Whitney U, and Kruskal-Wallis (Dunn post hoc) tests ($p<0.05$).

Results: A total of 231 adolescent patients (133 female and 98 male) with a mean age of 15.06 ± 1.61 years were examined. Higher anxiety scores were observed in patients from high-income families. In addition, patients receiving orthodontic treatment in private clinics reported significantly higher anxiety scores ($p<0.05$). Patients were more anxious and experienced fear when they had COVID-19-related symptoms or were exposed to COVID-19-positive patients ($p<0.05$). A positive correlation was found between the CAS and FC-19S scores (r =0.425; $p=0.001$) and between the treatment duration and FC-19S scores (r = 0.252; $p=0.025$).

Conclusion: In the presence of COVID-19-like pandemic disease, private clinicians should be aware of delayed appointments to reduce the anxiety level of their patients, taking into account their income level and exposure to infection.

Keywords: adolescent, anxiety, COVID-19, fear, anxiety scale, fear scale

OPEN ACCESS

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0) (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

The outbreak of the coronavirus disease 2019 (COVID-19) pandemic has profoundly impacted various facets of human life over the past few years. The highly contagious nature of COVID-19 and its deadly consequences have led to lifestyle changes, such as social distancing, avoidance of crowding, more frequent handwashing, and wearing masks in public places (1-3).

Pandemic conditions have caused temporary unemployment, working from home, continuing education at home with family support, restrictions such as a lack of physical contact with other people in daily life, and even short- or long-term curfews. All these regulations, which were implemented to reduce the spread of disease, have increased stress levels among adolescents (4).

Orthodontic treatment is generally applied to adolescent patients, and the treatment duration takes 2–3 years on average in most complex cases. Routine appointments should be carried out at intervals of 4–5 weeks because of the nature of tooth movement (5). For many protocols, appointments should be planned at more frequent intervals. Even a few days after a regular visit, a control appointment may be mandatory because of problems such as bracket debonding, wire breakage, and other appliance failures (6).

During the pandemic period, dental practitioners were susceptible to COVID-19 because of aerosol-producing procedures (7). This higher risk of infection also increases anxiety and fear among dental patients under clinical conditions (8). Despite the availability of protective measures, the pandemic process and its consequences have strongly aroused fears, worries, and anxiety among orthodontic patients in different regions across the world (9-12). Parallel to this, a remarkable decrease in the number of new patient visits and changes in orthodontists' interest in various appliances have been recorded in our country (13, 14). However, few studies were performed on orthodontic patients regarding COVID-19 anxiety levels (15-18).

With the normalization process, patients' anxiety levels have decreased in recent years. However, the question of how to approach orthodontic patients in the event of a newly emerging epidemic remains unanswered, even when many variables are examined, including demographics, treatment location, COVID-19 status, and various clinical aspects of the patients.

Therefore, the aim of this study was to evaluate the psychological impact of the COVID-19 pandemic on patients undergoing orthodontic treatment based on these parameters.

The null hypothesis was that there were no significant differences between the COVID-19 anxiety and fear levels of adolescent patients undergoing orthodontic treatment during the pandemic process, considering these variables.

Materials and Methods

This study was approved by the Ethics Committee of Hatay Mustafa Kemal University (2021/85) and followed the principles of the Declaration of Helsinki. This descriptive, cross-sectional, multicenter study included adolescent orthodontic patients from four private clinics and a university hospital. Informed consent was obtained from the patients and their parents.

Sample size calculation

Power analysis was performed using G*Power software (version 3.1.9.7, Heinrich Heine University, Düsseldorf, Germany) to determine the sample size. It showed that at least 176 patients were required to achieve 80% statistical power, considering an effect size of 0.50, based on a previous study (19).

Data collection

Data were collected from July 15 to September 15, 2021, from four different private orthodontic clinics and a public hospital during the pandemic. The study questionnaire (Fig. 1) included three sections to evaluate the (1) descriptive characteristics, (2) anxiety, and (3) fear levels of adolescents during the COVID-19 pandemic.

The first section consisted of 12 questions on topics including demographic characteristics (age, sex, education level, family monthly income), orthodontic treatment location and type (fixed labial or removable appliances, clear aligners, and others), and treatment time ("How long have you been in the procedure of orthodontic treatment?"), and COVID-19 status. The following questions were posed in a yes/no format: (Q8) "Did you have COVID-19-related symptoms such as fever, cough and fatigue without diagnosis and test application?" (Q9) "Did you have the diagnosis of COVID-19 disease?" and (Q10) "Did you have any close contact with patients diagnosed with positive COVID-19?". With the given responses, the patients were identified as having positive diagnoses, contact with a positive case, or COVID-19-related symptoms. Clinical conditions, including hospitalization and psychological support, were also investigated in this study.

Secondly, the Coronavirus Anxiety Scale (CAS) was used to evaluate the anxiety level of orthodontic patients in relation to the COVID-19 pandemic. This scale was developed by Lee (20) and translated into Turkish by Evren et al. (21). The CAS consists of five items and is rated using a 5-point scale: "not at all" (0), "rare, less than a day or two" (1), "several days" (2), "more than 7 days" (3), and "nearly every day over the last two weeks" (4). Higher scores indicate higher anxiety overall.

In the third section, the Fear of COVID-19 Scale (FCV-19S) was used to evaluate the patients' fear. This scale was developed by Ahorsu et al. (22) and reported as a valid and reliable measurement tool for children and

adolescents by Gozpınar et al. (23). FCV-19S consists of seven items rated on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The total score ranged from 7 to 35 points. Higher scores indicate greater coronophobia.

The questionnaire was self-administered by adolescent patients under clinical conditions in this study. However, some patients needed to ask their parents about their family income. In addition, the patients were informed that they did not have to answer questions if they were unwilling to do so.

Statistical analysis

Analyses were performed using the SPSS software (IBM SPSS Statistics version 21, IBM Inc., Armonk, NY, USA).

Normality was determined using the Shapiro-Wilk test. Student's t, Mann-Whitney U, and Kruskal-Wallis (Dunn post hoc) tests were used to compare parameters. The associations between the scale scores, age, and treatment duration were analyzed using the Spearman correlation coefficient. For all analyses, statistical significance was set at $p<0.05$.

Section 1. Descriptive information

Q1. Age:

Q2. Gender: Female □ Male □

Q3. Education level: Primary school □ High school □

Q4. Family monthly income
- a. < 3000 TL □
- b. 3000-5000 TL □
- c. 5000-8000 TL □
- d. > 8000 TL □

Q5. Location of orthodontic treatment: Private clinic □ University hospital □

Q6. Type of orthodontic treatment
- a. Removable appliances □
- b. Fixed labial appliances □
- c. Clear aligners □
- d. Other (Please explain) .....

Q7. How long have you been in the procedure of orthodontic treatment? ..... (months)

Q8. Did you have COVID-19-related symptoms such as fever, cough and fatigue without diagnosis and test application? Yes □ No □

Q9. Did you have the diagnosis of COVID-19 disease? Yes □ No □

Q10. Did you have any close contact with patients diagnosed with positive-COVID-19? Yes □ No □

Q11. Did you hospitalize during the COVID-19 outbreak? Yes □ No □

Q12. Did you receive psychological support during the COVID-19 outbreak? Yes □ No □

Section 2. Coronavirus Anxiety Scale (CAS)

How often have you experienced the following activities over the last 2 weeks?	Not at all	Rare, less than 1 a day or two	Several days	More than 7 days	Nearly every day over the last 2 weeks
Q1. I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus					
Q2. I had trouble falling or staying asleep because I was thinking about the coronavirus					
Q3. I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus					
Q4. I lost interest in eating when I thought about or was exposed to information about the coronavirus					
Q5. I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus					

Section 3. Fear of Coronavirus-19 Scale (FCV-19S)

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
Q1. I am most afraid of coronavirus-19					
Q2. It makes me uncomfortable to think about coronavirus-19					
Q3. My hands become clammy when I think about coronavirus-19					
Q4. I am afraid of losing my life because of coronavirus-19					
Q5. When watching news and stories about coronavirus-19 on social media, I become nervous or anxious					
Q6. I cannot sleep because I'm worrying about getting coronavirus-19					
Q7. My heart races or palpitates when I think about getting coronavirus-19					

Figure 1. The used questionnaire

Results

The distributions of the descriptive parameters are presented in Table 1. The participants consisted of 231 adolescent patients aged between 12 and 17 years, including 133 females (57.6%) and 98 males (42.4%), with a mean age of 15.06 ± 1.61 years.

The mean treatment duration was 18.27 ± 9.81 months. Almost all patients (n = 207) were treated with fixed appliances. Approximately 10% of patients were treated with clear aligners, removable appliances, or other appliances. Regarding treatment location, more than half of the patients were treated in private clinics.

In terms of COVID-19 status, 32.9% of patients had related symptoms, 30.9% had been in contact with a positive patient, and 17.7% had a positive diagnosis. Moreover, 3% of the positive patients had been hospitalized, and 2.2% of the orthodontic patients had received psychological support during the pandemic period.

The comparisons of the CAS scores in terms of descriptive characteristics are shown in Table 2. Among the demographic variables, significance was found only for family income. Patients from high-income families demonstrated the highest mean anxiety scores. Patients from low-income families (<3000 TL) were significantly less anxious than those with a monthly income between 3000 and 5000 TL ($p<0.05$). In addition, patients treated in a private clinic had significantly higher CAS scores than those attending the university hospital ($p<0.001$).

Both a positive COVID-19 diagnosis and contact with a positive patient had statistically significant effects on anxiety levels ($p<0.05$). Similarly, patients with related symptoms were more anxious than those without symptoms ($p<0.001$). Patients who received psychological support had significantly higher anxiety scores ($p<0.05$).

Patients demonstrated higher fear scale scores when exposed to positive patients or when they had COVID-19-related symptoms ($p<0.05$, Table 3). Significant positive correlations were found between treatment duration and fear, and between anxiety and fear scale scores ($p<0.05$, Table 4).

Table 1. Descriptive parameters of adolescent orthodontic patients.

		n	%
Gender	Male	98	42.4
	Female	133	57.6
Education level	Primary school	41	17.8
	High school	189	81.8
Family income (TL)	< 3000	45	20
	3000-5000	85	37.8
	5000-8000	65	28.9
	8000 +	30	13.3
Treatment location	Private clinic	122	54,5
	University hospital	102	45.5
COVID-19 status	Related symptoms	76	32.9
	Positive diagnosis	41	17.7
	Contact with positive	71	30.9
Other clinical conditions	Hospitalization	7	3
	Psychological support	5	2.2

TL: Turkish liras

Table 2. Coronavirus anxiety scale scores in terms of descriptive parameters.

		Anxiety scale scores		
		Mean±SD	Median (min-max)	p
Gender	Male	5.59±1.32	5 (5-13)	0.666*
	Female	5.6±1.19	5 (5-11)	
Education level	Primary	5.60±1.01	5 (5-8)	0.996**
	High school	5.60±1.29	5 (5-13)	
Family income (TL)	< 3000	5.25±0.72 [a]	5 (5-8)	0.007†
	3000-5000	5.43±0.97 [b]	5 (5-9)	
	5000-8000	5.83±1.34 [ab]	5 (5-11)	
	8000 +	6.17±1.97 [ab]	5 (5-13)	
Treatment location	Private clinic	5.92±1.49	5 (5-13)	<0.001**
	University hospital	5.21±0.67	5 (5-9)	
COVID-19 symptoms	Yes	6.17±1.64	5 (5-13)	<0.001*
	No	5.31±0.85	5 (5-9)	
COVID-19 positive diagnosis	Yes	5.93±1.15	5 (5-8)	0.004*
	No	5.52±1.25	5 (5-13)	
COVID-19 positive contact	Yes	5.97±1.54	5 (5-13)	0.001*
	No	5.43±1.05	5 (5-11)	
Hospitalization	Yes	6.14±1.21	6 (5-8)	0.068*
	No	5.58±1.24	5 (5-13)	
Psychological support	Yes	8.25±3.4	7,5 (5-13)	0.008*
	No	5.55±1.13	5 (5-11)	

* *p*-value was obtained from Student's t-test, ** *p*-value was obtained from Mann-Whitney U test, †p value was obtained from Kruskal-Wallis test, SD: Standard deviation, TL: Turkish liras, $p<0.05$. Within column for family income status, different letters in superscript indicate significant differences according to the Kruskal-Wallis post hoc Dunn test.

Table 3. Coronavirus fear scale scores in terms of descriptive parameters.

		Coronavirus fear scale scores		
		Mean±SD	Median (min-max)	p
Gender	Male	12.4±5.25	11 (7-29)	0.666*
	Female	14.32±5.48	13 (7-27)	
Education level	Primary	12.95±6.37	11 (7-29)	0.503**
	High school	13.68±5.28	13 (7-28)	
Family income	< 3000	14.23±4.9	13 (7-25)	0.207†
	3000-5000	12.6±4.7	11 (7-25)	
	5000-8000	14.47±6.13	14 (7-29)	
	8000 +	13.53±6.56	11.5 (7-28)	
Treatment location	Private clinic	13.55±5.98	13 (7-29)	0.581**
	University hospital	13.46±4.79	13 (7-25)	
COVID-19 symptoms	Yes	15.82±6.17	15 (7-29)	<0.001*
	No	12.37±4.67	12 (7-25)	
COVID-19 positive diagnosis	Yes	14.63±5.93	14 (7-29)	0.183*
	No	13.28±5.33	12.5 (7-28)	
COVID-19 positive contact	Yes	14.84±5.97	14 (7-28)	0.026*
	No	12.95±5.14	12.5 (7-29)	
Hospitalization	Yes	15.14±6.99	13 (7-27)	0.563*
	No	13.5±5.41	13 (7-29)	
Psychological support	Yes	17.75±7.85	17 (9-28)	0.205*
	No	13.45±5.4	13 (7-29)	

* p-value was obtained from Student's t-test
** p-value was obtained from the Mann-Whitney U test
† p-value was obtained from the Kruskal-Wallis test
SD: Standard deviation, $p<0.05$

Table 4. Correlations between orthodontic patients' anxiety, fear, age and treatment duration.

		Treatment duration	Coronavirus anxiety scale	Coronavirus fear scale
Age (years)	r	-0.004	-0.099	0.019
	p	0.959	0.138	0.776
	n	221	228	227
Treatment duration (months)	r		0.034	0.252
	p		0.614	0.025*
	n		218	217
Anxiety scale	r			0.425
	p			0.001*
	n			227

r: Spearman correlation coefficient, * $p<0.05$

Discussion

Türkiye is one of the countries most affected by COVID-19, and it has had a wide impact on many fields of daily routines (24). Although Turkish orthodontists following the guidelines and protective measures had subthreshold anxiety levels, this issue is worth investigating from the perspective of adolescent orthodontic patients' perspectives (25).

In the scope of this multicenter study, patients were selected from four private dental clinics and a public hospital located in the same region. The findings of this study indicated that there were no statistically significant differences between the sexes in terms of anxiety and fear scores. However, female orthodontic patients tended to be more psychologically vulnerable than males in previous studies (9-12, 15, 16). Yavan (15) reported that more than half of the patients were anxious during their first clinic visit, with a higher level among females, and trait anxiety levels remained stable during the one-year period of the pandemic (17). The differences between the results can be explained by the mean age of the study population. Younger patients who underwent orthodontic treatment at different clinics completed the questionnaires in the present study. Supporting previous findings, educational level had no influence on anxiety and fear levels (15, 17).

In contrast, family income was found to be associated with adolescent anxiety levels. Patients from high-income families showed higher anxiety levels. Since the minimum wage was approximately 3000 Turkish liras (TL) at the time of data collection, income level was categorized into four subgroups as follows: very low (<3000 TL), low (3000–5000 TL), moderate (5000–8000 TL), and high (>8000 TL) in this study. The only significant difference between very low and low family income was remarkable.

Patients received orthodontic health services from private clinics, with an increase in income levels in line with expectations. Although our country has entered a phase of normalization as of June 1, 2020, patients treated in private clinics were more likely to demonstrate increased anxiety in this study. This may be attributed to the fact that public hospitals continued to provide emergency treatment under stringent protective measures, while patient conditions were monitored through the healthcare provider system. Restrictive conditions were implemented in public clinics when there was a risk of contamination. In addition, temperature checks and extra-personal protective measures were supported by healthcare providers. These measures may have decreased the anxiety levels of adolescent patients in public hospitals. At this point, it was considered that the rules depending on personal preference may be flexible in the private clinics. However, strict infection control measures, minimal personal contact, and aerosol production should be considered to prevent contamination within orthodontic settings, as stated before (26). Arqub et al. (27) also reported that the majority of orthodontic patients were generally satisfied with restrictive protocols. Contrary to our results, Yavan (15) reported that patients (aged > 14 years) receiving fixed orthodontic treatment at a university hospital were anxious due to risky clinical situations for the spread of COVID-19 infection. Based on this, the patients were declared to resume treatment once the pandemic ended. It was thought that a higher proportion of female patients may have caused differences in anxiety levels with respect to treatment locations.

Another important variable was the treatment type, which was positively associated with anxiety (10, 12, 28). However, almost all patients had fixed appliances in this study; thus, the participants with other appliances were potentially inadequate for subgroup comparisons. In addition, a positive correlation was found between the duration of treatment and fear scale scores. As previously stated, patients were generally concerned with a possible delay in their treatment (9-12, 18, 29). At that point, it was observed that adolescents exhibited greater concern regarding governmental restrictions compared to the virus itself. These apprehensions were correlated with increased levels of anxiety (30).

Since regular visits are an inevitable factor in maintaining an ideal occlusion at the end of fixed treatment, a better understanding of patients' psychological status during the pandemic would help us develop strategies for orthodontic practice. Therefore, this study aimed to evaluate the COVID-19 status and its association with anxiety and fear levels among orthodontic adolescents. Based on our results, more than half of the patients had positive contact and symptoms. Almost one-third of patients showed symptoms of COVID-19 (76/231) or had contact with a positive case (71/231). Approximately one in every five patients (41/231) had a positive diagnosis. A significant association was found between COVID-19 status and increased anxiety. The presence of symptoms or COVID-19 contact significantly increased the fear of patients undergoing fixed orthodontic treatment. Moreover, three out of 100 patients were hospitalized, and almost two received psychological support. This could be a serious problem for public hospitals, where orthodontic health services were provided to thousands of people in cases of newly pandemic conditions. Therefore, appropriate measures should be taken by the orthodontics to reduce the anxiety of patients, as the pandemic process had a negative impact on the orthodontic treatment (31).

The validated scales were used to assess anxiety and fear levels of adolescent orthodontic patients in this study. Certain results, including the association between COVID diagnosis and anxiety, may be unsurprising, but have a novel contribution in providing data regarding COVID status. Consequently, the null hypothesis was rejected in this study. Anxiety level was affected by parameters such as income level, treatment location and COVID status.

Conclusion

Higher anxiety in patients was associated with a higher family income. Adolescents undergoing orthodontic treatment in private clinics were more anxious than those treated in public hospitals. Either form of COVID-19 status was likely to increase anxiety levels. Patients with related symptoms had significantly higher fear scores. A positive correlation was observed between the CAS and FC-19S scores, treatment duration, and coronophobia.

Disclosures

Ethical Approval: Ethics committee approval was received for this study from the Scientific Ethics Committee of the Hatay Mustafa Kemal University, in accordance the World Medical Association Declaration of Helsinki, with the approval number: 2021-85

Peer-review: Externally peer-reviewed.

Author Contributions: Conception – E.B.K.; Design – E.B.K., S.Ç., M.H.K.; Supervision – S.Ç., M.H.K.; Materials – S.Ç., E.B.K.; Data Collection and/or Processing – M.H.K., M.K.; Analysis and/or Interpretation – E.B.K., S.Ç.; Literature Review – S.Ç., M.H.K., M.K.; Writer –E.B.K.; Critical Review – E.B.K., S.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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

References

1. World Health Organization (WHO). Coronavirus disease (COVID-2019): Situation report-54. Available from: https://www.who.int/docs/default source/coronaviruse/situation-reports/20200314-sitrep-54-covid-19.pdf
2. Gönder HY, Fidan M, Demirel MG, Soybelli M, Alkurt S, Yüksel İB. Dentistry students after the COVID-19 outbreak—have views on distance education changed? Int Dent Res 2022;12(Suppl.1):34-43. https://doi.org/10.5577/intdentres.492
3. Üner DD, İzol BS. Evaluation of gingival crevicular fluid volume with periopapersin patients who have recovered from COVID-19 infections. Int Dent Res 2023;13(3):119-24. https://doi.org/10.5577/intdentres.492
4. Theberath M, Bauer D, Chen W, Salinas M, Mohabbat AB, Yang J, et al. Effects of COVID-19 pandemic on mental health of children and adolescents: A systematic review of survey studies. SAGE Open Med. 2022;10:20503121221086712. https://doi.org/10.1177/20503121221086712
5. Proffit WR, Fields HW, Sarver DM, Ackerman JL. Contemporary orthodontics. 5th ed. St. Louis, MO: Mosby Elsevier; 2013.
6. Smith, N.R. Reflections on twelve years of breakages - lessons to be learnt. Orthodontic Update 2017;10(4):707-709. https://doi.org/10.1177/0022034520914246
7. Meng L, Hua F, Bian Z. Coronavirus Disease 2019 (COVID-19): Emerging and future challenges for dental and oral medicine. J Dent Res 2020;99(5):481-487. https://doi.org/10.12968/ortu.2017.10.4.140
8. De Haro JC, Rosel EM, Salcedo-Bellido I, Leno-Durán E, Requena P, Barrios-Rodríguez R. Psychological impact of COVID-19 in the setting of dentistry: A review article. Int J Environ Res Public Health 2022;19(23):16216. https://doi.org/10.3390/ijerph192316216
9. Cotrin P, Peloso RM, Oliveira RC, de Oliveira RCG, Pini NIP, Valarelli FP, et al. Impact of coronavirus pandemic in appointments and anxiety/concerns of patients regarding orthodontic treatment. Orthod Craniofac Res 2020;23(4):455-461. https://doi.org/10.1111/ocr.12395
10. Xiong X, Wu Y, Fang X, Sun W, Ding Q, Yi Y, et al. Mental distress in orthodontic patients during the coronavirus disease 2019 pandemic. Am J Orthod Dentofacial Orthop 2020;158(6):824-833.e1. https://doi.org/10.1016/j.ajodo.2020.07.005
11. Moghadam MG, Omidkhoda M, Kazemi H. Oral health literacy and COVID-19 pandemic anxiety and concerns among Iranian orthodontic patients. Turk J Orthod 2021;34(2):93-101. https://doi.org/10.5152/TurkJOrthod.2021.20105
12. Quan S, Guo Y, Zhou J, Zhang G, Xing K, Mei H, et al. Orthodontic emergencies and mental state of Chinese orthodontic patients during the COVID-19 pandemic. BMC

Oral Health 2021;21(1):477. https://doi.org/10.1186/s12903-021-01834-3
13. Yavan MA. Effects of the COVID-19 pandemic on new patient visits for orthodontic treatment: A comparison of 2020 and the previous 3 years. J World Fed Orthod 2021;10(3):127-131. https://doi.org/10.1016/j.ejwf.2021.07.002
14. Eğlenen MN, Yavan MA. Has the COVID-19 pandemic affected orthodontists' interest in various orthodontic appliances? Turk J Orthod 2023;36(4):216-223. https://doi.org/10.4274/TurkJOrthod.2023.2022.124
15. Yavan MA. First clinical appointment after the COVID-19 lockdown: Reflections from orthodontic patients and their anxiety levels. Turk J Orthod 2021;34(2):86-92. https://doi.org/10.5152/TurkJOrthod.2021.20131
16. Yıldırım E, Adıgüzel A, Karaçay Ş. Assessment of the anxiety levels of orthodontic patients during the COVID-19 pandemic. Int Dent Res 2021;11(Suppl 1):74-80. https://doi.org/10.5577/intdentres.2021.vol11.suppl1.12
17. Yavan MA, Eğlenen MN. Evaluation of orthodontic patients' anxiety levels during the COVID-19 pandemic: A 1-year follow-up. Turk J Orthod 2022;35(3):180-185. https://doi.org/10.5152/TurkJOrthod.2022.22009
18. Tunca M, Naiboglu E, Keskin Tunc S. How did the COVID-19 pandemic affect the anxiety levels of individuals undergoing orthodontic treatment? East J Med 2023;28(3):395-402. https://doi.org/10.5505/ejm.2023.65148
19. Boyd CP, Kostanski M, Gullone E, Ollendick TH, Shek DT. Prevalence of anxiety and depression in Australian adolescents: comparisons with worldwide data. J Genet Psychol 2000;161(4):479-92. https://doi.org/10.1080/00221320009596726
20. Lee SA. Coronavirus Anxiety Scale: A brief mental health screener for COVID-19 related anxiety. Death Stud 2020;44(7):393-401. https://doi.org/10.1080/07481187.2020.1748481
21. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: A Turkish validation study of the Coronavirus Anxiety Scale. Death Stud 2022;46(5):1052-1058. https://doi.org/10.1080/07481187.2020.1774969
22. Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH. The fear of COVID-19 scale: Development and initial validation. Int J Ment Health Addict 2022;20(3):1537-1545. https://doi.org/10.1007/s11469-020-00270-8
23. Gozpinar N, Cakiroglu S, Kalinii EM, Ertas E, Gormez V. Turkish version of the Fear of COVID-19 Scale: Validity and reliability study for children and adolescents. Dusunen Adam 2021;34(1):32-40. https://doi.org/10.14744/DAJPNS.2021.00118
24. World Health Organization (WHO). Situation by Region, Country, Territory & Area. Available from: https://covid19.who.int/table. Access date: January 20, 2025.
25. Yilmaz HN, Ozbilen EO. The assessment of knowledge, behaviors, and anxiety levels of the orthodontists about COVID-19 pandemic. Turk J Orthod 2020;33(4):224-231. https://doi.org/10.5152/TurkJOrthod.2020.20128
26. Turkistani KA. Precautions and recommendations for orthodontic settings during the COVID-19 outbreak: A review. Am J Orthod Dentofacial Orthop 2020;158(2):175-181. https://doi.org/10.1016/j.ajodo.2020.04.016
27. Arqub SA, Voldman R, Ahmida A, Kuo CL, Godoy LDC, Nasrawi Y, et al. Patients' perceptions of orthodontic treatment experiences during COVID-19: a cross-sectional study. Prog Orthod 2021;22(1):17. https://doi.org/10.1186/s40510-021-00363-7
28. Xiang J, Xin Y, Wang R, Zhou H, Zou Y, Shim S, et al. Appointment impact and orthodontic emergency occurrence during the coronavirus disease 2019 pandemic: A retrospective study. Am J Orthod Dentofacial Orthop 2022;161(1):e12-e19. https://doi.org/10.1016/j.ajodo.2020.12.016
29. Peloso RM, Pini NIP, Sundfeld Neto D, Mori AA, Oliveira RCG, Valarelli FP, et al. How does the quarantine resulting from COVID-19 impact dental appointments and patient anxiety levels? Braz Oral Res 2020;34:e84. https://doi.org/10.1590/1807-3107bor-2020.vol34.0084
30. Magson NR, Freeman JYA, Rapee RM, Richardson CE, Oar EL, Fardouly J. Risk and protective factors for prospective changes in adolescent mental health during the COVID-19 pandemic. J Youth Adolesc 2021;50(1):44-57. https://doi.org/10.1007/s10964-020-01332-9
31. Umeh OD, Utomi IL, Isiekwe IG, Aladenika ET. Impact of the coronavirus disease 2019 pandemic on orthodontic patients and their attitude to orthodontic treatment. Am J Orthod Dentofacial Orthop 2021;159(5):e399-e409. https://doi.org/10.1016/j.ajodo.2020.11.030