



Assessment of the Fear and Anxiety of Children Referred to the Department of Pediatric Dentistry Before and During the COVID-19 Pandemic

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ABSTRACT

Aim: This study aimed to compare the dental fear and anxiety of dental patients aged 6-12 years before and during the coronavirus disease-2019 (COVID-19) pandemic.

Materials and Methods: The first phase of the study was conducted on Group 1 (n=350) before the pandemic and the second phase was conducted on Group 2 (n=350) during the COVID-19 pandemic. Dental anxiety and fear were assessed using 4 scales: the modified dental anxiety scale (MDAS), the modified child dental anxiety scale, the dental subscale of the children's fear survey schedule (CFSS-DS), and the dental fear scale (DFS). In the second phase, participants also filled out a questionnaire related to the COVID-19 pandemic. The data were analyzed using SPSS Statistics 25 (IBM, Armonk, New York).

Results: There were no significant differences between the two groups based on their socio-demographic variables ($p>0.05$). Scores during the pandemic decreased significantly for the MDAS, CFFS-DS and DFS ($p=0.002$, $p=0.002$, $p=0.010$, respectively). In Group 2, 2% of participants reported that their anxiety increased because of the changes in the dentists' personal protective equipment and 30.9% reported that they were anxious about COVID-19 transmission.

Conclusion: In this study, pediatric dental patients' dental fear and anxiety decreased during the COVID-19 pandemic. Personal protective equipment did not affect pediatric dental patients' dental fear and anxiety.

Keywords: Anxiety, pandemic, COVID-19, dental fear

Introduction

The global burden of the coronavirus disease-2019 (COVID-19) has changed dentists' clinical routines. Initially, the Centers for Disease Control and Prevention (CDC) recommended that dental procedures which are considered high-risk procedures should be limited to emergency dental practice in order to prevent the spread of COVID-19. In addition, patients postponed their oral health needs except

for problems which resulted in pain. However, it was accepted that the pandemic would not end in the foreseeable future (1). On June 3rd, 2020, the CDC provided revised guidelines titled "Interim Reopening Guidance for Dental Settings" and reported that routine dental procedures should be resumed, albeit with certain protective measures.

However, during the pandemic, it was reported that dental visit frequency decreased due to the fear of transmission, and social behaviors such as nutrition changed

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for the better or for the worse (2-5). The current literature revealed a decrease not only in using dental services, but also in tooth brushing frequencies and the self-perceived need for dental treatment among adolescents (6).

The transmission of severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) is associated with droplets, aerosol particles, and infected surfaces, meaning that dentists are at a high risk of transmission and of spreading the disease (7). Therefore, the proper use of personal protective equipment (PPE) is vital for dentists during dental procedures. After the pandemic broke out, dentists raised their protection levels and PPE usage and they felt more uncomfortable compared to their routine practice before the pandemic (4,8). Although pediatric dentists thought that the recommended PPE was not suitable for the non-pharmacological behavioral guidance on pediatric dental patients in the earlier stages of the pandemic, PPE was accepted as vital for preventing the spread of this disease. In addition, personal and equipment hygiene is crucial to prove trustworthiness to the patients and their parents with regards to dental procedures (1). Some of the PPE created a new look for dentists for their pediatric patients, and pediatric dentists continued to have some concerns about children's cooperation during dental procedures (1). These concerns remained as not only a thought, but also as some preventive attempts which were created, such as using posters concerning PPE for pediatric dental patients. Pre-appointment behavioral guidance was suggested to include illustrations concerning the dental visit and the appearance of the pediatric dentists (1). It is known that dental fear and anxiety are exhibited at all ages, but they usually start in childhood (9,10). Therefore, pediatric dentists have a big role in pediatric dental patients' dental histories. Dental fear and anxiety are associated with negative direct and indirect dental experiences, and also increased caries experience (11). Therefore, age-appropriate behavior guidance and pain control may affect the oral health of a child throughout their life.

In the literature, studies about dental fear, stress, and anxiety during the COVID-19 pandemic focused on the fear, stress, or anxiety of dental students, dentists, and dental providers (12-16). There is also a study in which parental fear and distress were evaluated during the pandemic (17). However, when considering dental treatment needs, especially in countries with high patient/disease levels related to caries and their consequences, data on the dental fear and anxiety of the patients during the pandemic period should not be ignored. To the best of our knowledge, there

has been no study in the literature to date which compared the dental fears and anxieties of pediatric patients between the pre-pandemic and pandemic periods, with consideration of their socio-demographic factors. The purpose of this study was to compare the dental anxiety and fear of pediatric dental patients before and during the COVID-19 pandemic. The null hypothesis was "there is no significant effect of the pandemic on the dental fear and anxiety of pediatric dental patients".

Materials and Methods

Ethical Consideration

The study protocol was approved by the İzmir Katip Çelebi University Non-interventional Clinical Research Ethics Committee (approval no: 129, date: 27.03.2019). A written informed consent form was obtained from all children and their parents or legal guardians.

Study Design and Sample

This cross-sectional study was conducted on 700 participants aged between 6 and 12 years, who were referred to the İzmir Katip Çelebi University Faculty of Dentistry, Department of Pediatric Dentistry.

In order to determine the sample size, the G*Power (G*Power Ver. 3.1.9.2 Germany) package program was used. For this purpose, considering the data of the studies of Yıldırım et al. (18) and Menziletoğlu et al. (19), it was predicted that there would be a 20% difference between dental fear and anxiety and sociodemographic factors. It was established that a sample size of 350 children would produce a power greater than 95% on a significance level of $p < 0.05$. In this context, the first phase of the study was completed on 350 children (Group 1; 217 girls, 133 boys; age range: 6-12 years, mean age: 9.3 ± 1.9 years). After the COVID-19 outbreak, the second phase was conducted on another 350 children (Group 2; 198 girls, 152 boys, age range: 6-12 years; mean age: 9.4 ± 1.9 years) who were referred to the same department.

Data Collection

The data were obtained in two stages; before the COVID-19 outbreak and during the pandemic. The first phase was performed in March and April, 2019 with 350 participants and the second phase of this study was conducted with 350 participants between the dates of September and December, 2020. All 700 participants answered the same questionnaires to evaluate their fear and anxiety. Also, a few questions related to the pandemic were included

in order to understand the patients' perceptions and knowledge in the second phase.

Dental fear and anxiety were assessed using the modified dental anxiety scale (MDAS), the modified child dental anxiety scale (MCDAS), the dental subscale of the children's fear survey schedule (CFSS-DS), and the dental fear scale (DFS). All the scales had been validated in their Turkish versions (20-23).

Statistical Analysis

The data were analyzed using the SPSS 25.0 software (IBM, Armonk, New York). Descriptive statistics of the parameters were given as; number, percentage, mean, standard deviation, minimum, median, and maximum. The normality of the data was tested with the Kolmogorov-Smirnov and Shapiro-Wilk tests. Non-parametric tests were used for non-normally distributed measurements. In the comparisons of quantitative data, the Mann-Whitney U Test was used for the measurements which did not have a normal distribution for differences between two groups. In the comparisons of the scores of more than two groups, the Kruskal-Wallis analysis was used. If there was a difference as a result of the analysis, Dunn's post-hoc test was used for pairwise comparisons. The socio-demographic characteristics between the two samples were analyzed with the Chi-squared test. The reliability of the scales used in this study was tested with the Cronbach alpha reliability analysis. In order to assess the correlation between the scales, Spearman correlation coefficients were calculated. The significance level for all analyses was accepted as $p < 0.05$.

Results

The comparisons of the socio-demographic characteristics and dental routines of the two groups are given in Table I. There was no significant difference between the study groups (Group 1, Group 2) in terms of the education levels of the mothers ($p = 0.486$) or fathers ($p = 0.864$), or the family income ($p = 0.535$). While 81% and 82.9% of the mothers' and the fathers' education levels were 8 years or more in Group 1; they were 73.9% and 75.1% in Group 2, respectively (Table I).

There was no statistically significant difference in the frequency of dental attendance ($X^2 = 17,330$, $p = 0.138$), dental treatment experience ($X^2 = 38,169$, $p = 0.327$), awareness of the planned treatment ($X^2 = 0.266$, $p = 0.606$), or the frequency of tooth brushing ($X^2 = 23,302$, $p = 0.078$) between Group 1 and Group 2 (Table I).

In this study, anxiety scores during the pandemic decreased significantly according to the MDAS, CFSS-DS and DFS ($p = 0.002$, $p = 0.002$, $p = 0.010$, respectively). However, the decrease in the MCDAS was not statistically significant ($p = 0.078$) (Table II).

In the second phase of this study, when Group 2 answered the questionnaire related to the pandemic, 83.1% of them were aware of the COVID-19 pandemic, 24% of them declared that they were more anxious compared to before the pandemic, and 9.1% of them declared that they were much more anxious than before the pandemic. While only 2% of the patients reported that their anxiety increased because of the differences in PPE, 30.9% reported that their reason was their fear of COVID-19 transmission. In the second PPE specific question, 8.3% of the patients reported that their anxiety increased because of the differences in the PPE during the pandemic (Table III).

In all scales, it was observed that the mean and median of the anxiety values of the participants who had no regular dental attendance were higher than those who had regular dental attendance. The values of MDAS, CFSS-DS, and DFS were significantly higher in those patients who did not have regular dental attendance than in those who attended every six months (Table IV). According to the CFSS-DS and DFS data, it was determined that the dental fears of those who did not have a habit of brushing their teeth were statistically significantly higher than those who brushed their teeth twice a day. When the relationship between regular dental attendance and the COVID-19 pandemic was analyzed by logistic regression analysis, regular dental visits during COVID-19 were 35.71 times less ($OR = 0.028$). During the COVID-19 period, regular tooth brushing (2 or more times per day) was 6.99 times less than before pandemic ($OR = 0.143$) (Table V).

When the anxiety values were compared according to previous treatment experiences, it was determined that the anxiety values of those children who only had tooth extractions were higher than those who previously had had a tooth extraction and filling, had only a filling, or did not receive treatment and this increase was significant in MDAS ($X^2 = 26,129$, $p < 0.01$).

In this study, the Cronbach's alpha reliability coefficient values to assess the internal consistency were calculated as 0.75, 0.76, 0.88, and 0.91 for MDAS, MCDAS, CC, and DFS, respectively.

The correlation between the MDAS and MCDAS ($r = 0.449$, $p < 0.05$), MDAS and CFSS-DS ($r = 0.498$, $p < 0.05$), MDAS and DFS ($r = 0.613$, $p < 0.05$), MCDAS and CFSS-DS ($r = 0.512$, $p < 0.05$), CFSS-DS and DFS ($r = 0.625$, $p < 0.05$), and

Table I. Comparison of socio-demographic data of parents and dental routine of the patients between before and during pandemic				
		Before pandemic n (%)	During pandemic n (%)	p-value
Education level of mother	Master/PhD	4 (1.1)	4 (1.1)	0.486
	University	95 (27.1)	78 (22.3)	
	High school	89 (25.4)	109 (31.1)	
	Middle school	96 (27.4)	68 (19.4)	
	Primary school	62 (17.7)	79 (22.6)	
	Uneducated	4 (1.1)	12 (3.4)	
Education level of father	Master/PhD	5 (1.4)	8 (2.3)	0.864
	University	66 (18.9)	107 (30.6)	
	High school	97 (27.7)	97 (27.7)	
	Middle school	95 (27.1)	78 (22.3)	
	Primary school	85 (24.3)	56 (16.0)	
	Uneducated	2 (0.6)	4 (1.1)	
Family income (TL)	0-600	17 (4.9)	3 (0.9)	0.535
	600-1000	42 (12.0)	31 (8.9)	
	1000-3000	185 (52.9)	138 (39.4)	
	3000 and higher	106 (100.0)	178 (50.9)	
Regular dental attendance	Once a year	119 (34.0)	16 (4.6)	0.138
	Once every six months	97 (27.7)	156 (44.6)	
	Once every three months	67 (19.1)	30 (8.6)	
	Once a month	60 (17.1)	0	
	None	7 (17.1)	148 (42.3)	
Dental treatment experience	Tooth extraction	37 (10.6)	47 (13.4)	0.327
	Tooth filling	166 (47.4)	121 (34.6)	
	Root canal treatment	50 (14.3)	17 (4.9)	
	Fissure sealant	58 (16.6)	15 (4.3)	
	Fluoride treatment	23 (6.6)	7 (2.0)	
	Space maintainer	0	15 (4.3)	
	Tooth filling and extraction	0	53 (15.1)	
	No treatment	16 (4.6)	75 (21.4)	
Awareness about the planning treatment	Yes	269 (76.9)	190 (54.3)	0.606
	No	81 (23.1)	160 (45.7)	
Frequency of tooth brushing	Three times a day	11 (3.1)	9 (2.6)	0.078
	Two times a day	16 (4.6)	106 (30.3)	
	Once a day	66 (18.9)	129 (36.9)	
	None	257 (73.4)	106 (30.3)	
	Total	350 (100.0)	350 (100.0)	

P-value represented from the chi-square test

Table II. Comparison of MDAS, MCDAS, CFSS-DS and DFS scores between before and during pandemic

		N	Min.	Median	Max.	Mean	SD	U	p-value
MDAS	Before pandemic	350	5.00	11.00	23.00	11.58	4.03	52974.500	0.002*
	During pandemic	350	5.00	10.00	23.00	10.61	3.92		
	Total	700	5.00	11.00	23.00	11.09	4.00		
MCDAS	Before pandemic	350	8.00	19.00	33.00	18.39	4.74	56550.000	0.078
	During pandemic	350	8.00	19.00	40.00	18.96	5.53		
	Total	700	8.00	19.00	40.00	18.68	5.15		
CFSS-DS	Before pandemic	350	15.00	31.00	65.00	33.03	10.43	52825.000	0.002*
	During pandemic	350	15.00	30.00	65.00	30.51	10.89		
	Total	700	15.00	31.00	65.00	31.77	10.73		
DFS	Before pandemic	350	20.00	36.00	80.00	37.29	11.52	54321.000	0.010*
	During pandemic	350	20.00	33.00	83.00	35.42	11.93		
	Total	700	20.00	35.00	83.00	36.35	11.76		

U: Mann-Whitney U test statistics, SD: Standard deviation, Min.: Minimum, Max.: Maximum, MDAS: Modified dental anxiety scale, MCDAS: Modified child dental anxiety scale, CFSS-DS: Dental subscale of the children's fear survey schedule, DFS: Dental fear scale

Table III. The number and percentage of answers given at the second stage (during the COVID-19 pandemic) of the study

Questions	Answers	n	%
Do you know about the COVID-19 pandemic?	No idea	59	16.9
	Virus caused disease	291	83.1
Is there a difference in your anxiety during the pandemic compared to before the pandemic?	No difference	52	14.9
	Less anxiety	182	52.0
	More anxiety	84	24.0
	Much more anxiety	32	9.1
	Not respond	185	52.9
What is the reason for the difference in your anxiety during the pandemic compared to before the pandemic visit?	Transmission of the disease	108	30.9
	Personal protective equipment	7	2.0
	None	49	14.0
	News on TV	1	0.3
	Yes	59	16.9
Did you have difficulty in reaching the doctor/treatment in the pandemic?	No	203	58.0
	Partially	88	25.1
	Yes	95	27.1
Did you worry about coming to the hospital?	No	180	51.4
	Partially	75	21.4
	Yes	29	8.3
Did the change in dentist's clothing in the pandemic raise your anxiety?	No	82	23.4
	Partially	239	68.3
	Total	350	100.0

COVID-19: Coronavirus disease-2019

Table IV. Comparison of anxiety and fear scale scores in terms of regular dental attendance during the pandemic period

		N	Min.	Median	Max.	Mean	SD	X ²	p-value	Post-hoc
MDAS	None (1)	148	5.00	11.00	23.00	11.50	4.10	11,649	0.009*	3<1
	Every three months (2)	30	5.00	9.00	17.00	9.83	3.90			
	Every six months (3)	156	5.00	10.00	20.00	9.96	3.63			
	Once a year (4)	16	5.00	10.00	18.00	10.19	3.56			
MCDAS	None (1)	148	8.00	20.00	40.00	19.78	5.24	6,616	0.085	
	Every three months (2)	30	8.00	17.00	30.00	17.80	5.77			
	Every six months (3)	156	8.00	19.00	33.00	18.60	5.65			
	Once a year (4)	16	8.00	17.00	26.00	17.13	5.70			
CFSSDS	None (1)	148	15.00	32.00	65.00	32.94	11.30	12,937	0.005*	3<1
	Every three months (2)	30	15.00	28.50	59.00	29.23	11.94			
	Every six months (3)	156	15.00	28.00	55.00	28.85	9.92			
	Once a year (4)	16	15.00	20.00	47.00	26.63	10.54			
DFS	None (1)	148	20.00	37.00	72.00	38.56	12.40	18,884	0.000*	3<1
	Every three months (2)	30	20.00	29.00	60.00	32.57	9.97			
	Every six months (3)	156	20.00	31.00	76.00	33.08	10.72			
	Once a year (4)	16	22.00	28.50	83.00	34.50	15.86			

X²: Kruskal-Wallis test statistics, Dunn's post-hoc was used for pairwise comparisons, * indicates p<0.05
Min.: Minimum, Max.: Maximum, SD: Standard deviation, MDAS: Modified dental anxiety scale, MCDAS: Modified child dental anxiety scale, CFSS-DS: Dental subscale of the children's fear survey schedule, DFS: Dental fear scale

Table V. The effect of COVID-19 pandemic on regular dental attendance and regular tooth brushing

		Before pandemic	During pandemic
		N (%)	N (%)
Regular dental attendance (Once a year or more often)	No	7 (2.0)	148 (42.3)
	Yes	343 (98.0)	202 (57.7)
	OR	1 (Reference)	0.028 (0.013-0.061)
Regular tooth brushing (Two times a day or more often)	<2	6 (1.7)	106 (30.3)
	2	344 (98.3)	244 (69.7)
	OR	1 (Reference)	0.143 (0.102-0.200)

Test results of logistic regression analysis; OR: Odds ratio, *p<0.05
COVID-19: Coronavirus disease-2019

MCDAS and DFS ($r=0.482$, $p<0.05$) were all moderately positive. There was no correlation between the patients' ages and their anxiety scale results (correlation coincidence between MDAS, MCDAS, CFSS-DS, DFS and age: -0.049 , -0.013 , -0.091 , -0.127 respectively).

Discussion

This study evaluated the dental fear of children aged between 6 and 12 years old before and during the pandemic. The results show that dental pediatric patients' anxieties

and fears decreased during the COVID-19 pandemic. This was the first study which compared the dental fear status of the patients in this age group before and after the pandemic. The two groups, which were similar based on their socio-demographic factors, were compared to evaluate the effects of the pandemic on their dental anxiety.

The decrease in the anxiety levels in the pandemic era may be explained by the decrease in the number of patients at the clinic. A less crowded, less noisy, and calmer environment might have decreased the anxiety levels.

This result was compatible with the result of a previous study which reported that patients' dental anxiety was associated with their waiting time before treatment (24). It has also been shown that the characteristics of the clinical environment are effective in the clinic experience of young people (25).

The participants of this study were school-age children so, when asked in the second phase of the study, most of them were aware of the COVID-19 pandemic. Less than half of participants reported feeling more anxious than their pre-pandemic dental experience levels. Also, more than half of them reported that they were less anxious compared to their pre-pandemic dental experiences. It was observed that the declarations of the participants were in accordance with the results of their dental anxiety scales. In a study conducted in Brazil, pediatric dentists reported that their routine treatment practices had changed, and they had reduced the use of high-speed instruments (8). In our clinic, a decrease in the frequency of using high-speed instruments may also have been effective on reducing dental anxiety and fear during the COVID-19 period.

Few participants (8.3%) reported that the changes in PPE of the clinicians increased their anxiety, and some of them (30.9%) reported that their anxiety increased due to fears of COVID-19 contamination. According to the results of this study, despite the estimations and hesitations of many clinicians, it was observed that the levels of fear and anxiety of children did not increase due to the changes in PPE and the precautions taken as a result of the pandemic.

Uncontrollability and unpredictability have been shown to be associated with dental fear (26). Non-invasive dental procedures can improve a patient's tolerance to more invasive procedures in following appointments (11,27,28). However, Corcoran et al. (26) reported that dental fear frequency was increased in adolescents with cleft lip and palate who had several dental procedures throughout their childhood. They attributed this situation to the low effectiveness of anesthesia (for patients with cleft involving lip) due to scar formation and due to the excessive treatment procedures which children with cleft lip and palate undergo (26). In this study, the fear and anxiety values of those patients who only had a tooth extraction history were higher (according to their MDAS and DFS values) compared to those who had other dental procedures or who had both fillings and extractions. Therefore, the results of this study showed the importance of delaying invasive procedures, such as elective extraction, to improve the child's cooperation.

It has been reported that the dental fear of the patients who did not have regular dental visits was increased compared to those patients who had regular dental visits (29,30). Similarly, in this study, the anxiety values of irregular attendees were higher than those of regular attendees. The least anxiety scores were assessed from those participants who has dental attendance every 6 months. We can explain the insignificant difference in anxiety levels between those with regular attendance every 3 months and those with irregular dental attendance by the fact that those patients with a high risk of caries needed more frequent dental visits. The fact that experience of treatment for caries and the need for more invasive treatments were associated with increased dental fear and anxiety supports this idea (11,26).

It has been reported that students' physical activity and their oral hygiene habits deteriorate during holidays and periods of disruption of daily routines compared to school time (31-33). In a cohort study evaluating the psychosocial and behavioral changes before and during pandemic among adolescents, it was reported that tooth brushing and oral health perception decreased significantly during the pandemic. They explained that this decrease might be associated with the extraordinary situation of pandemic (fear associated with COVID-19 related death etc.) (6). Consistent with the results of these studies, we determined a 6.99 and 35.71 fold decrease in regular tooth brushing and dental attendance respectively when comparing the periods before and during the pandemic.

In this study, no correlation was found between dental anxiety and age. Although there are many studies which have reported that dental fear and anxiety decreased with age, there are conflicting studies stating that it fluctuates with age or that it is not related to age (11,30,34-36). These conflicting results may be explained by variables such as differences in the study designs, the outcome measurements, the oral health behavior of the subjects, their dental pain, and/or differences in culture (11,37).

Study Limitations

This study was conducted with a new sample in the second phase instead of re-calling the previous participants. The same participants could not be recalled due to ethical reasons because there was still a risk of COVID-19 transmission but it was thought that including new participants who actually needed dental intervention and were referred to the clinic was reasonable. To mitigate any possible confounding factors in terms of this issue, we included a sample with similar sociodemographic characteristics. Caries and their results were not assessed,

and this can be considered as a limitation of this study due to the relationship between the treatment experiences for carries and the dental fear and anxiety of the patients (11).

Conclusion

In spite of the fear of COVID-19 transmission, dental fear and anxiety decreased during the pandemic. The changes in the dentist's appearance related to their PPE did not appear to have increased dental fear and anxiety in pediatric patients. Controlling environmental factors and decreasing the use of high speed instruments may have played a role in reducing the dental fear and anxiety levels of dental pediatric patients.

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Ethics

Ethics Committee Approval: The study protocol was approved by the İzmir Katip Çelebi University Non-interventional Clinical Research Ethics Committee (approval no: 129, date: 27.03.2019).

Informed Consent: All participants and their legal guardians were informed about this study and signed informed consent forms.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: E.K, F.Ç.D., Design: F.Ç.D., E.K., Data Collection or Processing: F.Ç.D., S.E.K., Analysis or Interpretation: F.Ç.D., Literature Search: F.Ç.D., E.K., Writing: F.Ç.D., E.K.

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