The effects of the COVID-19 pandemic on the oral health of patients

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Abstract:

Background/Aim: The coronavirus pandemic, which has affected the world, has also affected living habits, oral care and dental treatments. In this study, demographic characteristics, nutrition and lifestyle habits, systemic diseases, oral care and dental problems and solutions of adult individuals during the COVID-19 pandemic were investigated. **Material and Methods:** A questionnaire about demographic information and pandemic was distributed to 303 people aged between 18-75. Oral care was recorded using the 'Simplified Oral Hygiene Index'. In the examination of the categorical variables of the findings, Pearson Chi-Square test was used when the assumption of sample size (n>5) was met, and Fisher's Exact test was used when it was not. IBM SPSS Statistics 25 program was used in the statistical analysis. **Results:** It has been observed that the importance given to oral care and health is higher in young, single, educated and female participants, and oral care in-creased with anxiety level. It was observed that the participants most frequently preferred to go to the dentist if all other methods were unsuccessful (p<0.05). **Conclusions:** The pandemic period has affected oral health and care habits. It is thought that knowledge has an important role in increasing oral health in infectious diseases.

Keywords: care habits; Coronavirus pandemic; oral care; oral health

INTRODUCTION

The quarantine measures taken to combat COVID-19 in our country, as in the whole world, have greatly affected the physical and mental state, and as a result, daily activities and habits, including oral and dental health, have changed. Dental treatment procedures in the world are considered to be the highest risk categories for viral transmission. Therefore, the American Dental Association (ADA) recommends postponing all dental treatments except in emergencies such as severe toothache, osteitis, abscess or cellulitis, trauma, tooth fracture, avulsion or luxation. As in many developed countries, many scientific and legal regulations have been made in Turkey in line with the recommendations of the Ministry of Health Coronavirus Scientific Advisory Board, in order to carry out only emergency and compulsory dental treatments and to postpone elective procedures [1].

Suspending the general services of most dental institutions in Turkey and limiting the procedures performed to only emergency dentistry services as they produce many droplets and aerosols that cause the transmission of pathogens, results in the delay of the treatment needs of the patients and this leads to a decrease in the quality of life of the patients [2]. It has become very important to investigate the effects of COVID-19 on oral health [3]. Despite widespread debate about the possibility of airborne transmission, transmission of COVID-19 by droplets and contact has been confirmed. The oral cavity is considered one of the main entry routes of the virus. Therefore, optimizing oral health is very important in preventing COVID-19 infection [4].

Behaviors related to oral and dental health includes practices such as tooth brushing, flossing, nutrition control, dental check-ups, tobacco use. These factors should be taken into consideration while planning of health services, intervention programs, and in the creation of goals or strategies. Through oral hygiene indexes, clinicians can have an objective opinion about patients' oralcare levels. This data helps the clinician to determine the treatment protocol to follow or frequency of control appointments. The Simplified Oral Hygiene Index, created by simplifying the Oral Hygiene Index, which is a method for classifying the oral hy-

giene status of population groups; it is a faster method for measuring the oral hygiene level of population groups [5]. That's why it's chosen for this study to shorten the examination process during the pandemic.

Considering the transmission routes of SARS-CoV-2 or in another name: COVID-19 and the working principles of dentists, patients and dental staff are at high risk for COVID-19 infection due to droplets and aerosols formed during dental procedures. Mostly in oral and dental health clinics, dentists and staff are usually in close contact with patients face-to-face during dental procedures [6].

In the literature review, no scientific study was found that examines how the COVID-19 pandemic affects oral and dental health, care habits and dental treatments in Turkey. In the planned study, the socioeconomic characteristics, nutrition, alcohol consumption and smoking, tooth brushing habits, frequency of dental visits, the course of systemic diseases, if any, their oral hygiene levels, whether they encountered dental problems during the COVID-19 pandemic, of adult individuals who applied to Uşak University Faculty of Dentistry and how they come up with a solution when they encounter it will be investigated.

MATERIAL AND METHODS

The study was performed in conformance with the Declaration of Helsinki ethical guidelines. Ethical approval for this study was obtained from the Uşak University Faculty of Medicine Clinical Research Ethics Committee (Date: 13.10.2021 No: E-38824465-020-47708). The population of the study consists of patients who applied to Usak University Faculty of Dentistry. The participants within the scope of the survey were randomly selected among the patients who applied to the Department of Restorative Dentistry Clinic and the study lasted for two months between October 2021 and December 2021. Inclusion criteria included being over 18 years old and volunteering to participate. Among the criteria for not being included in the study are being mentally disabled, being under the age of 18, being illiterate and not agreeing to participate. The importance and method of the study were explained to the participants in detail, and the informed consent form of the patients was obtained in written form.

A questionnaire was prepared by the researchers as a result of the literature review, aiming to evaluate demographic data, oral hygiene habits, systemic diseases of patients, anxiety about Covid-19, oral problems experienced and solutions found by patients during the pandemic. A questionnaire consisting of 31 questions was administered to the participants. Patients were examined by the same researcher and Simplified Oral Hygiene Index data were recorded. To measure, six teeth representing anterior and posterior teeth including the facial surfaces of teeth 16-26-11 and the lingual surfaces of teeth 36-46-31 were evaluated for the presence of debris and calculus.

For the analysis of the relationships when α=0.05 and since there was no similar study in this area before the standardized effect size was taken 0.30 (moderate) as suggested by Cohen's (1988), the minimum sample size with a power of 0.95 was found 172 using G. Power- 3.1.9.2 software.

As the first step of the descriptive statistical analysis, the assumption of normality was checked with the Shapiro Wilk test. Mann Whitney U test was used to compare the means of two groups that did not have a normal distribution. The Kruskal Wallis test was used to compare the means of three or more groups that did not have a normal distribution. Post Hoc Bonferroni test was applied to reveal the group or groups that made the difference. Spearman correlation was used to measure the relationship between continuous variables that do not conform to the normal distribution. The sample size assumption was checked to test the hypotheses that will investigate the relationship in pairwise comparisons. Pearson Chi-Square test was used when the assumption was met and Fisher's Exact test was used when it was not met. Analyzes were performed in IBM SPSS 25 program.

RESULTS

A total of 303 people, 114 men and 189 women, participated in the study. Demographic data of individuals participating in the study is shown in Table 1.

A significant correlation was found between education status, income status and oral care. As the education and income levels of the patients increase, oral care increases. It was determined that 19.5% (n=59) of the participants had COVID-19 disease and 72.6% (n=220) did not, while 7.9% (n=24) did not know whether they had it or not. When questions about anxiety were asked, participants were found to have mild anxiety symptoms. The percentages of answers to anxiety-related questions are shown in Table 2.

Table 1. Demographic Data of Individuals Participating in the Study

		n	%
Gender	Male	114	37.6
	Female	189	62.4
Age	18-30	112	37.0
	31-40	75	24.8
	41-50	68	22.4
	51-60	31	10.2
	61-70	14	4.6
	71+	3	1.0
Marital status	Married	210	69.3
	Single	83	27.4
	Divorced	10	3.3
Education status	Primary School	63	20.8
	Mid School	41	13.5
	High School	86	28.4
	Undergraduate	104	34.3
	Graduate and above	8	2.6
	None	1	0.3
Living area	Rural	39	12.9
	Town	9	3.0
	Town Center	36	11.9
	City Center	219	72.3
Working status	Yes	140	46.2
	No	163	53.8
How would you define your monthly income?	Low	84	27.7
	Middle	210	69.3
	Upper	9	3.0
Health insurance status	State health insurance	260	85.8
	Private health insurance	11	3.6
	No health insurance	32	10.6

People working during the coronavirus pandemic had higher anxiety about the pandemic, and the change in their daily habits such as daily sleep and nutrition was found to be higher than others. It was found that women pay more attention to tooth brushing, going to the dentist, had more sleep problems and had more concern. The percentage of answers given to the questions showing the change in the life habits and about their approach to dental treatments and dental health of the participants is presented in Table 3.

Table 2. Percentage of the Answers Given to the Questions Indicating the Anxiety Associated with the COVID-19 Pandemic of the Individuals Participating in the Study

		n	%
Do you feel nervous and anxious when you think about or are exposed to coronavirus-related topics?	Never	83	27.4
	Sometimes	170	56.1
	Often	25	8.3
	Always	25	8.3
Do you feel sad and frightened when you think about or are exposed to coronavirus-related topics?	Never	89	29.4
	Sometimes	161	53.1
	Often	27	8.9
	Always	26	8.6
Have you had trouble falling asleep or have poor-quality sleep when thinking about or being exposed to coronavirus-related topics?	Never	191	63.0
	Sometimes	90	29.7
	Often	15	5.0
	Always	7	2.3

During the coronavirus pandemic, 11.5% of the participants had bleeding gums, 5.2% had tooth abscess, 32.4% had toothache, 5.4% had 20-year-old tooth inflammation, 8.8% had bad breath, 2.5% of them had mouth ulcers, 4.2% of them had jaw and temporamandibular joint disorders, 4.9% of them had other mouth problems and 25.1% of them had no mouth problems.

When participants was examined according to the age groups during the pandemic process, it was determined that the Simplified Oral Hygiene Index (OHI-S) scores of the patients in the 18-30 age group were lower than the patients in the 61 and over age group. Single female participants were found to have lower Simplified Oral Hygiene Index (OHI-S) scores and higher oral care. It has been found that patients who are worried or afraid of the Covid-19 pandemic, know the risk of transmission during treatment, and are worried about the safety of dental treatment during the pandemic, have better oral care and have a lower scores in OHI-S. The mean scores of the participants in the indexes are presented in Table 4.

Table 3. Percentage of the Answers Given to the Questions About the Change of Living Habits and the Approach to Dental Treatments

		n	%
Have your daily working and resting hours changed during the coronavirus pandemic?	Yes	104	34.3
	No	199	65.6
How has your eating frequency changed compared to before the coronavirus pandemic?	Increase	46	15.2
	Decrease	27	8.9
	Same	230	75.9
Has your tobacco consumption changed compared to before the coronavirus pandemic?	Increase	14	4.6
	Decrease	19	6.3
	Same	64	21.1
	I don't use tobacco	202	66.7
	I started to use tobacco	4	1.3

How often do you brush your teeth during the coronavirus pandemic?	Twice a day or more	117	38.6
	Once a day	133	43.9
	Less than once a day	53	17.5
Has your brushing frequency changed compared to before the coronavirus pandemic?	Increase	53	17.5
	Decrease	14	4.6
	Same	236	77.9
Compared to before the coronavirus pandemic, do you pay more attention to hygiene and oral health during the coronavirus pandemic than before?	I pay more attention	176	58.1
	Didn't change	113	37.3
	I pay less attention	9	3.0
	I didn't think of it	5	1.7
Has the frequency of your visits to the dentist changed during the coronavirus pandemic?	Increase	44	14.5
	Decrease	44	14.5
	Same	215	71.0
What did you do when faced with dental or oral problems during coronavirus pandemic?	I endured and didn't mind	91	29.6
	I got a prescription from a doctor	36	11.7
	I consulted the dental institutions online	13	4.2
	I searched for emergency dental service and could not find it	39	12.7
	I searched for emergency dental service and found it	90	29.3
	I took medicine myself without consulting a doctor	38	12.4
Do you know that there is a risk of contracting an infectious disease during dental procedures?	Yes	229	75.6
	No	74	24.4
Are you worried about dental treatment's safety during the coronavirus pandemic?	Worried	112	37.0
	Not worried	121	39.9
	I didn't think of it	70	23.1
Are you paying more attention to oral health and prevention of oral diseases during the coronavirus pandemic?	I pay more attention	180	59.4
	Didn't change	93	30.7
	I pay less attention	9	3.0
	I didn't think of it	21	6.9
What will you do when you have oral or dental problems after coronavirus pandemic?	I won't mind problems	9	3.0
	I will solve without going to a dentist	11	3.6
	If all other methods fail I will go to a dentist	100	33.0
	I will go to a dentist after consulting online	24	7.9
	I will go to a dentist using personal protective equipment	159	52.4

Table 4. Distribution of Participants by Simplified Debris, Calculus and Oral Hygiene Indexes

	n	Min	Max	Mean	Standard Deviation
S-Debris Index	303	0	3	1.5550	0.78975
S-Calculus Index	303	0	3	0.8520	0.65835
S-OHI	303	0	6	2.4070	1.32318

DISCUSSION

Oral and dental health of individuals varies depending on various factors as well as the pandemic. In the study conducted by Koseoglu et al. [7], it was found that tooth brushing and interface cleaning habits differ according to gender, age and education level, and in the study of Besiroglu and Lutfioglu [8], regular brushing is higher in single women and those with high income and education level. In the study of Coskun and Unlu [9], 32.3% of women and 19% of men brush their teeth twice a day. In another study conducted by Ince and Aksoy [10], it was observed that the frequency of tooth brushing increased in both men and women in the adult patient population during the pandemic process. In our study, 38.6% of the participants reported brushing frequency as twice or more as 43.9% once a day and 17.5% less than once a day. The simplified oral hygiene index (OHI-S) scores of female participants were found to be lower. It has been observed that women increased brushing more than men. Oral hygiene of women, individuals between the ages of 18-30 and those with higher education levels were found to be better.

According to a study conducted by Dilber and Dilber [11] in Turkey, eating habits were affected during COVID-19, while men stated that being sedentary at home negatively affected their health and the number of meals has increased. This situation can be explained by the fact that mostly men work in Turkish society. According to the income level, it has been seen that individuals with high income have more sleep problems. Again, in the study of Yuce and Muz [12], it was observed that appetite and snacking habits increased during the restrictions, and it was found that more than half of the participants were stayed indoors and sedentary during the day. In the study of Di Renzo et al. [13], 48.6% of 3533 participants reported increased perception of weight gain and 34.4% reported an increase in appetite [13]. In our study, however, no direct significant relationship was observed between income status and sleep, and it was found that the sleep patterns and quality of women and individuals whose rest and working hours changed were adversely affected. It was observed that the appetite of 15.2% of the participants increased, while the appetite of 3% of them decreased.

Di Renzo et al. [13] found that 3.3% of smokers quit during the pandemic which can be explained by the increased respiratory distress in smokers and the fear of death from COVID-19. Another study of 53,000 people in the UK found higher prevalence of COVID-19 among smokers [15]. In a meta-analysis by Patanavanich and Glantz [16] which total of 11,590 COVID-19 patients were examined, disease progression was observed as 29.8% in smokers, while Reddy et al. [14] meta-analysis results from 47 studies including 32,849 hospitalized COVID-19 patients had shown that history of smoking was related to severe COVID-19 progression and an increased need for respiratory support,. In our study, it was found that 4.6% of smokers increased, 6.3% decreased, 21.1% did not change their habit while 66.7% of the participants didn't smoke. It was found that those who increased smoking paid less attention to oral health and prevention of oral diseases during the coronavirus pandemic. When Covid-19 disease history was questioned, it was seen that 79.7% of those who had the disease did not smoke. This may be due to the fact that 66.7% of the participants weren't smokers.

Systematic review by Salari et al. [17] has shown that, 5 studies with a sample size of 9074, the prevalence of stress was 29.6%, in 17 studies with a sample size of 63,439, the prevalence of anxiety was 31.9%, and in 14 studies with a sample size of 44,531, the prevalence of depression was 33.7%. According to studies conducted in the USA during the COVID-19 pandemic, women were evaluated as significantly more stressful than men [18][19]. Bruine de Bruin [20], on the other hand, found in the United States, age was associated with perceiving greater infection-death risks, but found that older people had better mental health. According to the research by Röhr et al. [21] in Germany, it was re-

ported that the mental health of the elderly population didn't change greatly during the COVID-19 quarantine. Huang and Zhao [22], in a web-based study of 7,236 people in the Chinese population, showed that the prevalence of generalized anxiety disorder is high and sleep quality is low during the COVID-19 process. Anxiety was found to be higher in people younger than 35 years of age. Tonbul [23] found that women are more psychologically resilient than men. Tee et al. [24] found higher levels of stress, anxiety, and depression in women, teens, singles, students, during the COVID-19 pandemic in the Philippines. In our study, the effect of anxiety and worry about the Covid-19 pandemic was found to be greater in women than in men. The reason for this might be that women have more sleep disorders and the number of females are more than men.

Anxiety can lead to avoidance towards dental visits. In a study with soldiers, significantly more caries lesions were found in anxious individuals [25]. In a study by Fatima et al. [26], it was revealed that individuals with depression had significantly higher debris, calculus, pocket depth, gingival index, and clinical attachment level compared to healthy individuals. Patients with depression may experience difficulties in starting and maintaining dental examinations. According to a systematic review conducted on patients diagnosed with anxiety and depression, an increase in caries and tooth loss rates was found [27]. Susanto et al. [28] reported that oral health, dry mouth and stomatitis were associated with stress levels. In our study, when oral diseases were examined between those who had Covid-19 disease and those who did not, no significant results were found.

Increased pneumonia, during the COVID process were found to be associated with changing oral biofilms and periodontal disease due to systemic diseases, so it was thought that there was a link between poor oral health and COVID-19 complications [29]. In a prospective observational study by Costa et al. [30] with 128 hospitalized patients aged 20 to 97 years and diagnosed with COVID-19, a positive association was found between bad oral health, periodontitis, and severe COVID-19 outcomes. In the study by Gurbuz and Ceylan [31], no evidence found to support the relationship between oral hygiene and periodontal disease with COVID-19 while Coke et al. [32] suggested that periodontal health could help determine the severity of COVID-19 infection. Botros et al. [33] found that most patients with severe complications of COVID-19 had poor periodontal health. According to our study, although the rate of Covid-19 transmission was higher in individuals with "halitosis", which is an important indicator of

periodontal disease and oral hygiene insufficiency, this isn't statistically significant.

In the study of Geduk et al. [34] with 400 patients, it was found that 99% of the individuals were aware of COVID-19, 47% thought it was contagious and 53% thought it was not contagious. According to the results obtained, statistically significant differences were observed in terms of age, education and marital status in matters related to transmission. In our study, when the educational status and the awareness of infection risk during dental procedures are compared, it's observed that the level of risk awareness increases as the education level. It was found all of the graduate and 84.6% of the undergraduate answered as yes.

In the study of Keles and Sancakli [35], which consisted of 1010 people, most of the participants thought that oral and general health were related, and 80% of them were of the opinion that there is a risk of COVID-19 transmission in dental treatment. Also 21.7% of the participants experienced a problem related to oral and dental health during the COVID-19 process. In our study, it was observed that 75.6% of the participants were aware of the risk of transmission, 29.6% of the patients did not care, 29.3% sought emergency treatment and 12.7% did not seek emergency treatment. It was found that 11.7% of them had a doctor's prescription and 12.4% of them used drugs without consulting the doctor.

A study by Pazinska et al. [36] conducted with 2574 people in Poland found that during the pandemic, nearly half of the participants avoided regular dental visits, while only 0.5% used online consultations. According to the results of our study, 4.2% of the participants consulted dentistry institutions online. Increasing studies on these services can help find solutions to emergencies by minimizing the risk of transmission of patients during epidemics.

Limitations of our work: In the study, the OHI-S scale was used to measure the level of oral hygiene. Results may differ with other periodontal scales. The research covers only a certain part of the pandemic and does not cover the initial onset and regression periods can't be evaluated.

CONCLUSIONS

In our study, it was determined that the COVID-19 pandemic has an effect on oral and dental health and oral care habits. It is observed that young participants pay

more attention to oral health and care. When participants OHI-S scores examined 18-30 age group was found to be lower than 61+ age group. Being woman, single, high education and high income is found significantly related to good oral care. During the pandemic process it's seen that participants whose working, mostly didn't care about the dental problems they had and chose to endure them, while unemployed participants have looked for a emergency dental service. It's observed that most of the patients were aware of the infection risk with COVID-19 while dental procedures. Also participants with anxiety found to have lower OHI-S scores and good oral care habits. Regardless of gender and educational status, it has been observed that when participants have a problem with their oral health in the future, they most often choose to go to the dentist if all other methods fail or go to the dentist by using personal protective equipment.

Conflict of Interests

Nothing to declare.

Financial Disclosure Statement

Nothing to declare.

Human Rights Statement

All the procedures on humans were conducted in accordance with the Helsinki Declaration of 1975, as revised 2000. Consent was obtained from the patient/s and approved for the current study by national ethical committee.

Animal Rights Statement

None required.

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