Original Article / Özgün Araştırma

Psychological Effects of COVID-19 Pandemic in Dental Healthcare Workers

COVID-19 Pandemisinin Diş Sağlığı Çalışanlarının Psikolojileri Üzerine Etkileri

Gözde Kandemir Demirci[1], Mustafa Melih Bilgi[2], Esin Erdoğan[2], İlknur Kaşıkçı Bilgi[3], Mehmet Kemal Çalışkan[1]

[1]Ege University Faculty of Dentistry, Department of Endodontology, İzmir, Turkey
[2]University of Health Sciences Turkey, İzmir Bozyaka Training and Research Hospital, Clinic of Psychiatry, İzmir, Turkey
[3]Bornova Oral and Dental Health Center, İzmir, Turkey

Keywords
COVID-19, dental care, dentistry, healthcare worker, psychological stress

Anahtar Kelimeler
COVID-19, diş bakımı, diş hekimliği, sağlık çalışanı, psikolojik stres

Received/Geliş Tarihi : 23.11.2021
Accepted/Kabul Tarihi : 10.12.2021

doi:10.4274/meandros.galenos.2021.58751

Address for Correspondence/Yazışma Adresi:
Gözde Kandemir Demirci MD,
Ege University Faculty of Dentistry,
Department of Endodontology, İzmir, Turkey
Phone : +90 232 311 46 08
E-mail : dt.gozdekandemir@hotmail.com
ORCID ID: orcid.org/0000-0001-7327-1010

Abstract

Objective: This study aimed to evaluate the mental health status of Dental Health Care Workers (DHCWs) in a dental emergency university clinic treating urgent patients during the pandemic.

Materials and Methods: A hundred fifteen participants were selected from DHCWs who actively worked during the pandemic in a Dental Emergency Clinic of a university. Depression, anxiety and stress levels of participants were measured with the Depression-Anxiety-Stress Scale and their insomnia levels were assessed with the Insomnia Severity Index. Correlations between independent continuous and dependent variables tested with Spearman test. Mann-Whitney U and Kruskal-Wallis tests were used used to evaluate possible effects of independent variables. The psychological data of the aerosol-generating treatment group were compared to the rest of the participants using Mann-Whitney U tests. In all tests α=0.05 significance level was set.

Results: The rates of DHCWs scored above the cut-off points were 54% for depression, 40% for anxiety, 36% for stress and 40% for insomnia. Feeling negative emotions before the pandemic significantly interacted with all psychometric measurements. Younger age, feeling anxious about changing working conditions and/or obtaining personal protective equipment was correlated positively with stress points (p=0.035, p=0.008, p=0.007, respectively). A significant percentage of DHCWs presented high scores on depression, anxiety, stress and insomnia in this study.

Conclusion: The authorities and healthcare executives must show programmed leadership and support for DHCWs during the COVID-19 outbreak. The integration of programs developed to mitigate stress among DHCWs recommended during the COVID-19 pandemic.

Öz

Amaç: Bu çalışmanın amacı, COVID-19 pandemisi sırasında acil hastaları tedavi eden bir diş hekimliği acil üniversite kliniğindeki Diş Sağlığı Çalışanlarının (DSÇ) ruh sağlığı durumunu değerlendirmektir.

Gereç ve Yöntemler: Bir üniversitenin acil diş kliniğinde pandemi sırasında aktif olarak çalışan DSÇ'lerden 115 katılımcı seçildi. Katılımcıların depresyon, anksiyete ve stres düzeyleri Depresyon-Anksiyete-Stres Ölçeği ile, uykusuzluk düzeyleri ise uykusuzluk şiddet indeksi ile değerlendirildi. Bağımsız sürekli ve bağımlı değişkenler

arasındaki korelasyonlar Spearman testi ile test edildi. Bağımsız değişkenlerin olası etkilerini değerlendirmek için Mann-Whitney U ve Kruskal-Wallis testleri kullanıldı. Aerosol oluşturan tedaviler grubunun psikolojik verileri, Mann-Whitney U testi kullanılarak diğer katılımcılarla karşılaştırıldı. Tüm testlerde α=0,05 anlamlılık düzeyi kabul edilmektedir.

Bulgular: Kesme puanının üzerinde puanlanan DSÇ'lerin oranı depresyon için %54, anksiyete için %40, stres için %36 ve uykusuzluk için %40 idi. Pandemiden önce olumsuz duygular hissetmek, tüm psikometrik ölçümlerle önemli ölçüde etkileşime girdi. Yaşın küçük olması, çalışma koşullarının değişmesi ve/veya kişisel koruyucu ekipman edinme konusunda endişeli olması stres puanları ile pozitif yönde ilişkili bulunmuştur (sırasıyla p=0,035, p=0,008, p=0,007). DHCW'lerin önemli yüzdeleri bu çalışmada depresyon, anksiyete, stres ve uykusuzluk puanlarında yüksek puan aldı.

Sonuç: Yetkililerin ve sağlık yöneticilerinin COVID-19 salgını sırasında DSÇ'lere programlı liderlik ve destek göstermeleri gerektiği sonucuna vardık. COVID-19 salgını sırasında DSÇ'ler arasında stresi azaltmak için geliştirilen programların entegrasyonu önerilmektedir.

Introduction

In late 2019, a novel coronavirus severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) which is an enveloped RNA virus that is contagious among humans was reported in China (1). SARS-CoV-2 is a beta-coronavirus belonging to the important "coronavirus" family (2). Two coronaviruses have caused severe epidemics in humans: the SARS-CoV occurred in China in 2002-2003 and the Middle East Respiratory Syndrome-Coronavirus (MERS-CoV) appeared in Saudi Arabia in 2012 (3,4). World Health Organization announced the coronavirus disease-2019 (COVID-19) as a pandemic on 11 March 2020.

Transmission of the virus is possible by direct contact with an area contaminated by saliva droplets or salivary secretions that are expelled during speech, sneezing or coughing attacks (5). SARS-CoV-2 virus survives on the dry inert surfaces only a few hours (6), but may live several days in aqueous surroundings (7). SARS-CoV-2 enters the body throughout the mucous membranes (oral, nasal or even conjunctival ocular) or the skin (through a wound) (8). It has been reported that virus shedding can also happen in the absence of clinical symptoms (9). Although the measures taken in all dental offices seem sufficient, dentists like whole other healthcare staff may be exposed to COVID-19 unintendedly due to asymptomatic and pre-symptomatic transmission of SARS-CoV-2 (9,10).

Dental health care workers (DHCWs) had the greatest COVID-19 risk of any other profession due to their close contact with patients (11). Dental procedures involve the use of aerosol-generating devices, in addition to working in close proximity with the oral mucosa and secretions. The high risk of COVID-19 cross infection can occur through inhalation of aerosol and droplets from infected persons or by direct interaction with mucous membranes, oral fluids and contaminated instruments and surfaces (12).

Additionally, it was reported that the higher expression of key receptor (angiotensin-converting enzyme 2) for COVID-19 in minor salivary glands than in lungs and salivary glands might present a reservoir for COVID-19 asymptomatic infection (13). The positive rate of SARS-CoV-2 in the saliva of patients can reach up to 100%, and live virus can cultivate in saliva samples (13,14), therefore the strong potential infectivity of saliva should be considered (14). All these specific conditions and high-risk factors make DHCWs more vulnerable to the SARS-CoV-2 infection.

Hitherto, many guidelines, reviews, articles and editorials including urgent dental treatment protocols for prevention or controlling the spread of SARS-CoV-2 were published (15,16). However, the number of confirmed and possible cases has continued to increase and deaths of health care workers (HCWs) during pandemic were reported. On the other hand, the workload and work pressure on DHCWs have also increased. Due to the risk of exposure to the virus, DHCWs fear of being infected and spreading the virus to family, friends or colleagues is increasing (17). It was reported that the increased level of depression, anxiety, insomnia and stress symptoms among medical staffs worked in epidemic prevention and control were as high as 50.7%, 44.7%, 36.1% and 73.4%, respectively (18). In March 2020, when coronavirus lockdowns and stay at home orders were enured to slow the spread of the COVID-19 outbreak, academic dental institutions also had to take measures quickly against the rapidly developing crisis in Turkey. Routine dental procedures were cancelled and only urgent dental treatment procedures were performed in order to prevent the transmission of COVID-19 to the community. Dental and oral surgery treatments

were limited to non-aerosol-generating procedures to decrease the risks of transmission of SARS-CoV-2. More specifically, the usage of dental drills and ultrasonic instruments were largely reduced and personal protective equipment (PPE) were provided to dentists and dental-staff working in the pandemic clinics. The aim of this study was to evaluate mental health status of DHCWs in Dental Emergency Clinic of a University in Turkey treating urgent dental patients during the COVID-19 outbreak. Primarily, depression, anxiety, stress and insomnia levels of all DHCWs' were measured. As a second outcome, the psychological characteristics of the dentists working on aerosol-generating treatments (endodontists and pedodontists) and their assisting dental staffs were compared to those of the other dental specialists in practice.

Materials and Methods

Participant Selection

The study protocol was reviewed and approved by the Local Ethical Committee (no: 65234543-050.06.04, date: 29.06.2020). All participants were selected from DHCWs who actively worked during the pandemic in a Dental Emergency Clinic of a university in Turkey, between 16th March and 31th May 2020. They were informed about the study in written form and only the individuals who signed the consent form were included. Face-to-face interviews were conducted with 115 participants by the same researcher during the pandemic. Study sample consists of 85 dentists (postgraduate students and post-master degree academics involved in clinical practice) and 30 dental staffs. Fifty-three participants in the whole group worked on dental emergency treatments involving the use of aerosol-generating devices. We reached nearly all target population, but only five dental staffs refused our invitation to the study. Cases with moderate or higher severity of psychological symptoms were referred to related branches for counselling and support.

Data Collection Form

This form included questions about sociodemographic variables (age, gender, marital status), family relations (distancing from family, fear of infecting family members) and social relations (stigmatization, negative manners from society), encountering infection (infected by SARS-CoV-2, treating patients who were later diagnosed SARS-CoV-2), history of psychiatric treatment before and during pandemic, and occupational conditions (work experience, workload, cooperation with co-workers, management support, gaining PPE, satisfaction from work).

Psychometric Scales

Depression-Anxiety-Stress Scale (DASS-42) is a self-report four-point Likert type scale including 42 items reflecting depression, anxiety and stress levels of individuals at last week (19). In Turkish validity and reliability study of DASS-42, cut-off points for depression (9<), anxiety (7<) and stress (14<) have been reported previously (20).

Insomnia Severity Index (ISI) is a self-report five-point Likert type scale measuring severity of insomnia (0-28 points) by seven questions (21). Developers of ISI noted that scoring above ten points indicates insomnia and scoring higher than fifteen points means clinical insomnia. The validity and reliability of the Turkish form of ISI were studied formerly (22).

Statistical Analyses

All of the data violated normal distribution, so non-parametric tests were used in this study. Correlations between independent continuous variables and dependent variables were tested with Spearman test. Possible significant effects of independent categoric variables in the data collection form on psychometric parameters were analyzed with Mann-Whitney U Test for two levels. For multi-levels, Kruskal-Wallis Test were used. If any significant result was obtained with Kruskal-Wallis Test, then Mann-Whitney U Tests were performed for multiple comparisons between groups with Bonferroni correction. The psychological data of aerosol-generating treatments group were compared to the rest of the participants using Mann-Whitney U Test. In all tests α=0.05 significance level was accepted.

Results

Sociodemographic variables, psychometric measurements and dichotomous variables regarding possible psychological effects of SARS-CoV-2 were shown in Table 1. Severity distribution of psychiatric symptoms according to the cut-off points were presented in Table 2. The other measures of data

collection form were demonstrated in Table 3 and Table 4. All psychometric measurements (depression, anxiety, stress, insomnia scores) were significantly and positively correlated with each other (p<0.001). Age was significantly and negatively correlated with stress scores (p=0.035).

There was a significant interaction between treated patient's number and stress scores (H=11.5 df=3 p=0.009). Subgroup analyses revealed that stress scores of DHCWs treating average 5-10 patients [n=35, med=15 (2-37)] were higher than those who were treating 10-15 patients in a day [n=12, med=6 (0-22), p=0.018] (Table 3).

Feeling anxious before pandemic was significantly correlated with all psychometric measurements (p<0.001 for stress and depression scores, p=0.001 for anxiety scores and p=0.017 for insomnia scores). Subgroup analyses for stress scores demonstrated that mild, moderate and severe level groups scored significantly higher than normal level group (p=0.001, p<0.001 and p=0.028, respectively). Regarding anxiety points, subgroup analyses showed that mild, moderate and severe level groups had significantly higher anxiety points compared to normal level group (p=0.016, p=0.02, p=0.032, respectively). When compared to the no anxiety group, feeling mild, moderate, severe and extremely severe anxious before pandemic groups were significantly more depressive (p=0.012, p=0.004, p=0.034 and p=0.39, respectively). Additionally, the only significant difference for insomnia points was between the severe level and normal level groups (p=0.038) (Table 3).

Feeling depressive before pandemic was significantly related with all psychometric measurements (p<0.001 for stress and depression scores, p=0.004 for anxiety scores and for insomnia scores). Subsequent analyses for stress points demonstrated that severe, moderate and mild level groups scored significantly higher than normal level group (p=0.002, p=0.004 and p=0.011, respectively). The only significant difference regarding anxiety points was between severe and normal level groups (severe>never p=0.007). Feeling depressive before pandemic presented significantly higher depression scores for severe and moderate groups compared to the never group (p=0.001 and p=0.03, respectively). Subgroup analyses for insomnia scores revealed that severe, moderate and mild level groups had significantly higher insomnia scores than the normal level group (p=0.039, p=0.016 and p=0.037, respectively) (Table 3).

Feeling anxious about variations in working conditions or increasing workload during or after pandemic was significantly interacted with stress points (p=0.016). Subgroup analyses explained this interaction with feeling severe level anxiety of DHCWs had higher stress points than feeling mild level ones (p=0.008) (Table 4). Feeling anxious about obtaining PPE during or after pandemic also was significantly related to stress points (p=0.021). Very severe level anxious group scored significantly higher stress points than mild level anxious group (p=0.007) (Table 3).

Table 1. Sociodemographic, psychometric and dichotomous variables

Variables (n=115)	Mean ± SD	(Median/ minimum-maximum)
Age	31.8±9	(27/23-60)
Working Experience (year)	8.3±9.6	(3/1-39)
DASS-42-Depression Score	11.2±8	(11/0-37)
DASS-42-Anxiety Score	7±5.9	(6/0-28)
DASS-42-Stress Score	12.6±7.6	(12/0-37)
ISI-Insomnia Score	6.9±4.7	(6/0-24)

DASS-42: Depression-Anxiety-Stress Scale, ISI: Insomnia Severity Index, SD: Standard Deviation

Table 2. Severity levels of psychometric scale results

Psychiatric measurements	Healthy (n %)	Mild (n %)	Moderate (n %)	Severe (n %)	Very severe (n %)
DASS-42-Depression Level	53 (46)	22 (19)	28 (24)	7 (6.4)	5 (4.6)
DASS-42-Anxiety Level	69 (60)	12 (10)	20 (18)	8 (7)	6 (5)
DASS-42-Stress Level	74 (64)	19 (17)	17 (15)	3 (2.6)	2 (1.4)
ISI-Insomnia Level	69 (60)	39 (34)	5 (4.6)	2 (1.4)	0 (0)

DASS-42: Depression-Anxiety-Stress Scale, ISI: Insomnia Severity Index

Gender, marital status, isolation from family, working frequency, psychiatric help before pandemic, psychiatric help during pandemic, SARS-CoV-2 infection of relative, SARS-CoV-2 related dead of relative, negative reaction of society, stigmatization, hiding job from society, support form colleagues, feeling anxious during dental treatment, fear of infecting relatives, satisfaction from decisions of

Table 3. Analysis of factors significantly associated with psychological stress of DCHWs

Variables	n (%)	SS ± SD	AS ± SD	DS ± SD	IS ± SD
Treated patient's number in a day					
0-5	48 (41.7)	12.19±6.68	6.17±4.96	10.38±7.36	6.29±3.28
5-10	35 (30.4)	15.97±8.56*	8.74±7.04	14.31±9.05	8.03±5.98
10-15	12 (10.4)	8.17±6.97*	5.75±5.91	9.42±7.95	6.67±5.94
20<	20 (17.4)	10.20±5.78	6.40±5.21	9.05±6.43	6.45±4.27
p-value	-	0.009*	0.350	0.076	0.763
Feeling anxious before pandemic					
Normal	26 (22.6)	6.81±5.58	3.62±3.67*	6.77±6.05	4.62±3.15*
Mild	52 (45.2)	13.96±7.03	7.83±6.16*	12.54±8.55	7.79±5.09
Moderate	27 (23.5)	14.81±7.10	8.37±6.24*	12.89±6.29	6.67±4.08
Severe	6 (5.2)	18±9.82	10.17±4.26*	17.33±9.67	11±6.57*
Extremely severe	4 (3.5)	8.75±5.32	2.75±2.63*	3.25±2.06	5.25±2.5
p-value	-	0.000*	0.001*	0.000*	0.017*
Feeling depressive before pandemic					
Normal	31 (27)	8.06±5.54*	4.32±3.77*	7.35±6*	4.39±3.01*
Mild	44 (38.3)	13.55±6.97*	7.64±6.64	11.86±7.91	7.25±4.67*
Moderate	24 (20.9)	14.29±6.19*	7.67±5.40	12.75±6.84*	8.04±5.05*
Severe	12 (10.4)	18.92±10.62*	11.08±5.90*	18.42±9.86*	9.33±6.24*
Extremely severe	4 (3.5)	7.50±4.20*	3±2.31	4±2.94	8±4.24*
p-value	-	0.000*	0.004*	0.000*	0.004*
Feeling anxious about working conditions during/after pandemic					
Normal	8 (7)	11.63±6.57	5.62±3.46	11±7.05	5.88±7.47
Mild	26 (22.6)	8.42±6.97*	5.38±5.13	7.92±7.08	6.12±4.3
Moderate	30 (26.1)	12.37±5.72	6.47±4.71	11.10±6.05	5.93±3.86
Severe	26 (22.6)	15.08±6.49*	9.12±7.5	13±8.5	7.88±4.70
Extremely severe	25 (21.7)	14.84±9.7	7.32±6.2	13.12±9.97	8.12±4.88
p-value	-	0.016*	0.390	0.168	0.182
Feeling anxious about obtaining personal protective equipment					
Normal	9 (7.8)	11.11±6.76	8.67±6.2	11.44±6.2	6.33±7.47
Mild	27 (23.5)	8.93±6.64*	5.44±4.5	8.15±5.7	6.7±3.86
Moderate	24 (20.9)	12.71±5.92	6.38±4.68	11.21±7.06	6.29±3.47
Severe	29 (25.2)	12.45±6.40	6.93±6.98	10.55±7.55	6.66±4.09
Extremely severe	26 (22.6)	16.88±9.36*	8.46±6.48	15.19±10.43	8.08±5.98
p-value	-	0.021*	0.392	0.124	0.849

SP: Stress score, AP: Anxiety score, DP: Depression score, IP: Insomnia score, *Statistically significant difference, SD: Standard Deviation

management during pandemic, being educated enough about working under pandemic conditions, achieving team-work with colleagues, job satisfaction had no significant effect on psychometric points of DHCWs ($p>0.05$). There was no significant difference between two groups of DHWCs (working on aerosol-generating treatments and the other ones) in all psychometric measures ($p>0.05$) (Table 4).

Discussion

The present study is conducted on DHCWs who worked actively at a specific university clinic during nationwide lockdown in Turkey. Most of the studies about the mental health of DHCWs during the COVID-19 pandemic have used internet platforms (23-28). To our knowledge, this is the first face-to face report on mental health outcomes and associated risk factors among DHCWs in Turkey during the COVID-19 pandemic. In the current investigation, Turkish DHCWs displayed overall high psychological impact of the COVID-19 outbreak in terms of stress, anxiety, depression, and insomnia as estimated by the DASS-42 and ISI survey systems. Among the remarkable findings of our study, the variation in working conditions and the state of being anxious about the supply of PPE were found to be related to the stress levels of the individuals. Dentists (endodontists and pedodontists) and their assisting dental staffs working on aerosol-generating treatments, did not differ in terms of psychological characteristics from the group that did not give aerosol-generating treatments. Since there was no study related to aerosol generating and non-aerosol generating procedures comparison in the dentistry, the results of this study could not be compared directly. However, the reason for the lack of difference between the two groups may be that nearly in all dental procedures, DHCWs have a fear that if they could have been exposed by aerosol with coughing or sneezing (etc.) even the procedure is a non-aerosol generating procedure like local anesthesia (29). Therefore, DHCWs had a long and stressful working life under heavy conditions before the pandemic due to their profession, and this situation facilitated their psychological adaptation to the pandemic conditions.

Our results revealed that both the high level of psychometric rates (40% vs 24% for anxiety, 54% vs 23% for depression, 40% vs 34% for insomnia) and the distribution of moderate-severe psychiatric symptoms of DHCWs (30% vs 6.8% for anxiety, 35% vs 16% for depression) were significantly higher than the prevalence rates of HCWs reported in a recent meta-analysis study (30). In another study, severity distribution of depression, anxiety and insomnia symptoms of frontline HCWs treating patients with COVID-19 were very similar to the severity distribution of DHCWs in this study (31). Özarslan and Caliskan (25) reported that dentists taking part in the filiation service showed significantly higher stress levels than the dentists not involved in filiation. It is important to consider how these results that were collected during an infectious disease epidemic reflect the effects of psychological distress and burnout on dental staff. The results of the aforementioned studies reported important evidences about the negative psychological effects of the COVID-19 pandemic on healthcare workers.

Since the SARS-CoV-2 pandemic, several studies have been performed investigating the impact of pandemic on dental professionals' mental health (23-28). When the literature is examined, the inclusion of DHCWs working from home and the collection of data with online surveys may create difficulties in interpreting the results of the previous studies. In our study, a negative relationship was found between sample age and the stress scores. The result of a recent study supported this finding, the stress levels of dentists with more than 20 years of professional experience were found to be lower (26). Consistent with these results, in two separate studies, younger endodontists had higher stress levels than older ones (27,28). Another study investigated depression, stress, and anxiety levels of physicians during the COVID-19 outbreak and reported that being male, older, and having more work experience were associated with lower depression, stress, and anxiety scores (32). Relatively higher prevalence rates of psychological symptoms might be related to the dominancy of young DHCW respondents in this study and longer practicing with acquired experience in time may have made it easier to cope with stress during the pandemic (33).

Feeling anxious about obtaining PPE during and after pandemic increased stress levels of DHCWs in the current study. Studies supporting this result have reported that high stress levels are correlated with a fear of contracting SARS-CoV-2 from a patient (23). In this study, despite a group of DHCWs treating fewer patients than the other group, they scored higher

Table 4. Analysis of psychological parameters of DCHWs with non-significant impacts						
Variables	**n (%)**	**SS ± SD**	**AS ± SD**	**DS ± SD**	**IS ± SD**	**p-value**
Gender						
Male	19 (16.5)	12.11±6.8	6.53±5.98	11.42±6.58	6.84±3.65	>0.05
Female	96 (83.5)	12.67±7.72	7.03±5.86	11.21±8.29	6.9±4.9	
Marital status						
Single	76 (66.1)	13.39±8	6.99±6.18	11.91±8.34	6.67±4.45	>0.05
Married	39 (33.9)	10.97±6.41	6.87±5.23	9.95±7.24	7.31±5.19	
Aerosol spreading work						
Yes	53 (46.1)	12.47±8.34	7.58±5.62	11.70±8.2	7.23±5.4	>0.05
No	62 (53.9)	12.66±6.88	6.40±6.04	10.85±7.8	6.60±4.02	
Isolation from family						
Yes	43 (37.4)	13.6±7.96	7.28±6.76	11.81±8.69	7.35±4.75	>0.05
No	72 (62.6)	12.22±7.34	6.75±5.28	10.90±7.62	6.61±4.69	
Working frequency						
Never	8 (7)	11.75±8.32	6.38±6.16	9.13±9.75	4.5±3.97	>0.05
Once in a month	4 (3.5)	9.75±3.10	3.5±3.0	5.25±2.5	5.25±2.06	
Twice in a month	75 (65.2)	12.89±7.9	6.99±5.58	11.59±8.24	7.03±4.87	
Once in a week	18 (15.7)	13.56±6.77	8.39±5.89	13.28±6.08	7.67±5.14	
Twice in a week/more	8 (7)	8.88±6.8	3.75±3.24	7.37±7.33	6.38±3.93	
Every day	2 (1.7)	15.5±9.19	14.5±19.1	16±12.73	9.5±2.12	
Psychiatric help before pandemic						
Yes	7 (6.1)	10.86±8.13	5.57±5.5	7±6.25	6.71±4.46	>0.05
No	108 (93.9)	12.69±7.55	7.04±5.89	11.52±8.05	6.90±4.74	
Psychiatric help during pandemic						
Yes	3 (2.6)	13±11.53	10.67±8.39	12±10.58	2.67±3.06	>0.05
No	112 (97.4)	12.56±7.50	6.85±5.79	11.22±7.99	7±4.70	
SARS-CoV-2 infection of relative						
Yes	6 (5.2)	16.17±8.77	9.33±6.02	14.83±9.22	8.33±5.82	>0.05
No	109 (94.8)	12.38±7.48	6.82±5.85	11.05±7.94	6.81±4.66	
SARS-CoV-2 related dead relative						
Yes	3 (2.6)	7.33±7.51	5.67±4.51	5.67±6.66	2.33±4.04	>0.05
No	112 (97.4)	12.71±7.54	6.98±5.90	11.39±8.01	7.01±4.68	
Negative reaction of society						
Yes	24 (20.8)	12.58±7.75	7.62±4.18	10.54±5.74	7.29±3.47	>0.05
No	91 (79.2)	12.57±7.5	6.77±6.23	11.43±8.52	6.78±4.99	
Stigmatization						
Yes	34 (29.6)	13.47±7.46	8.38±6.38	12.09±8.39	7.82±5	>0.05
No	81 (70.4)	12.20±7.62	6.35±5.55	10.89±7.87	6.49±4.55	
Hiding job from society						
Yes	7 (6.1)	13.71±10.40	8±6.19	10.57±11.10	5.57±3.16	>0.05
No	108 (93.9)	12.50±7.40	6.88±5.86	11.29±7.83	6.97±4.79	

Table 4. Continued						
Support from colleagues						
None	6 (5.2)	7.67±5.82	2.83±3.76	6±5.10	5±4.65	>0.05
Some	15 (13)	14.40±9.6	7.4±8.6	11±9.43	7.73±3.43	
Medium-level	60 (52.2)	13.05±7.47	7.63±5.7	12.32±8.24	7.60±5.27	
A lot	22 (19.1)	11.95±6.5	6.14±4.88	9.18±6.13	5.27±2.86	
Quite a lot	12 (10.4)	11.50±7.63	6.5±4.76	12.58±8.45	6.17±5.32	
Feeling anxious during dental treatment						
Normal	5 (4.3)	7±6.40	3.60±3.65	8.60±5.77	4.60±3.36	>0.05
Mild	23 (20)	9.78±7.84	5.48±5.62	8.91± 8.18	6.35±4.01	
Moderate	39 (33.9)	12.46±6.30	6.31±5.64	10.38±6.65	6.03±3.07	
Severe	29 (25.2)	13.97±6.33	8.24±5.88	12.69±8.32	8.03±6.15	
Extremely severe	19 (16.59)	15.53±10.04	8.95±6.41	14.32±9.59	8.16±5.66	
Fear of infecting relatives						
Normal	4 (3.5)	8±8.49	6±5.35	8.75±6.34	5.75±5.91	>0.05
Mild	14 (12.2)	9.93±5.81	5.50±6.96	9.14±6.27	5.71±3.65	
Moderate	13 (11.3)	14.38±8.09	7.69±5.78	11.77±8.86	5.77±4.23	
Severe	41 (35.7)	11.12±6.89	6.78±5.94	10.76±7.85	6.59±4.08	
Extremely severe	43 (37.4)	14.70±7.98	7.44±5.62	12.47±8.60	8±5.50	
Management satisfaction						
Yes	58 (50.4)	12.24±7	6.78±5.88	10.69±7.83	6.38±5.05	>0.05
No	57 (49.6)	12.91±8.14	7.12±5.88	11.81±8.21	7.40±4.31	
Being educated enough about working under pandemic conditions						
None	25 (21.7)	14.44±9.47	7.80±7.36	12.68±10.69	7.76±5.24	>0.05
Some	33 (28.7)	12.67±6.35	7.45±5.25	11.67±5.69	6.06±5.05	
Medium-level	45 (39.1)	11.36±6.87	6.42±5.77	10.27±8.28	6.71±3.59	
A lot	10 (8.7)	13.80±9.15	6±4.57	11.30±6.52	9±6.20	
Quite a lot	2 (1.7)	9±7.07	4.50±3.54	8±2.83	3±4.24	
Achieving team-work with colleagues						
None	9 (7.8)	10.56±6.46	3.89±4.17	7.22±5.20	4.67±3.43	>0.05
Some	13 (11.3)	11.23±7.33	5.23±4.64	10±4.76	6.46±4.23	
Medium-level	36 (31.3)	13.14±8.48	7.53±6.28	11.97±9.38	7.06±4.70	
A lot	41 (35.7)	11.78±5.94	7.27±5.7	10.54±6.14	6.34±3.34	
Quite a lot	16 (13.9)	15.56±9.54	7.94±6.71	14.69±11.07	9.50±7.33	
Job satisfaction						
None	57 (49.6)	13.05±8.14	6.68±5.74	11.53±7.71	7.56±5.18	>0.05
Some	33 (28.7)	11.94±7.69	6.85±5.7	11.06±9.11	5.55±4.25	
Medium-level	22 (19.1)	12.45±5.8	7.05±5.15	10.50±7.17	7.32±4.05	
A lot	3 (2.6)	11.33±9.24	12.33±13.65	13.33±10.21	5.67±2.51	

SP: Stress score, AP: Anxiety score, DP: Depression score, IP: Insomnia score, SD: Standard Deviation, SARS-CoV-2: Severe acute respiratory syndrome coronovirus-2

stress points than the latter. This finding is supported by a similar study which reported that DHCWs' perceived stress level was disproportionate with workload (23).

All psychological symptom scores were significantly and positively correlated with each other in line with literature (34). Feeling anxious and/or depressive before pandemic was correlated positively with all psychometric measurements during the pandemic in this study. Paulus and Stein (35) reported that negative feelings stemming from negative beliefs about self, others and future have key roles in developing anxiety and depressive disorders through dysfunctional interoceptive prediction schemas. Negative cognitive styles and stress-reactive rumination predicts greater number and longer durations of depressive episodes in a longitudinal study (36).

Pandemics are known to affect mental health of the general population and various at-risk groups like healthcare workers, students and people with chronic medical diseases (30). However, not much is known of the mental health of people with pre-existing mental illness during a pandemic. In our study, it was observed that a limited number of cases received psychiatric help before and during the pandemic, and it was determined that receiving psychiatric help before or during the pandemic did not have a significant effect on the psychometric points of DHCWs. Although it could not be generalized to the whole population due to the limited number of the cases, there was no relationship between receiving psychiatric help before and during the pandemic. A recent systematic review and meta-analysis of 15 studies investigates, whether people with pre-existing mental illness experience an increase in mental health symptoms and experience more hospitalizations during a pandemic (37). People with pre-existing mental illness have significantly higher psychiatric symptoms, anxiety symptoms and depressive symptoms compared to controls during a pandemic with pooled effect sizes (SMD) of 0.593 [95% confidence interval (CI) 0.46 to 0.72], 0.616 (95% CI 0.49 to 0.73) and 0.597 (95% CI 0.38 to 0.80) respectively. Major symptoms identified included increased anxiety, depression and insomnia. It is noteworthy that the aforementioned studies include mixed samples and general populations other than healthcare professionals.

The present study has several strengths and limitations. Strengths of this study are accuracy of data collection, homogeneous sample selection, acquiring data during the pandemic for preventing recall bias. One of the important limitation is its cross sectional nature and lack of the follow-up on a longitudinal level. Small sample size selected from a specific university clinic and female dominancy of DHCWs may also reduce generalizability of the results. We applied self-report questionnaire to assess psychological symptoms that do not rely on diagnostic evaluation. Adding a clinical mental health evaluation by psychiatric specialists would definitely contribute to the outcome of this survey. Regardless of the above limitations, conclusions of this study provide important information on the psychological impact of COVID-19 on DHCWs.

Conclusion

DHCWs had significantly high prevalence rates of depression, anxiety, stress and insomnia symptoms. Younger age, and feeling anxiety about acquiring PPE increases stress level. Feeling negative emotions before pandemic is positively correlated with depression, anxiety, stress and insomnia scores. Psychiatric screening before and during the pandemic, improving coping skills with negative emotions, encouraging and supporting vulnerable ones for psychological therapies like making regular aerobic exercise and scheduled psychiatric interviews, providing appropriate PPE and working conditions, regular screening for SARS-CoV-2 infection are essential interventions for alleviating psychological symptoms of DHCWs related to COVID-19 pandemic. Based on the nature of the dental profession, the stress on DHCWs will be increased with especially aerosol-generating procedures. Planning longitudinal studies about screening mental status of DHCWs and testing the effect of interventions for relieving the psychological impairments related to long-running traumatizing course of COVID-19 pandemic is strongly recommended.

Acknowledgements: The authors would like to thank Assoc. Prof. Dr. Timur Köse from Ege University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, for his valuable contributions in statistical analyses and interpretations of data, and

Prof. Dr. Pelin Güneri for her support and valuable suggestions.

Ethics

Ethics Committee Approval: The present cohort study was designed as a survey and was approved by the Clinical Research Ethics Committee of Ege University Faculty of Dentistry (no: 65234543-050.06.04, date: 29.06.2020).

Informed Consent: They were informed about the study in written form and only the individuals who signed the consent form were included.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: G.K.D., M.K.Ç. Concept: G.K.D., İ.K.B., Design: G.K.D., M.M.B., E.E., İ.K.B., M.K.Ç., Data Collection or Processing: G.K.D., M.M.B., E.E., Analysis or Interpretation: G.K.D., M.M.B., Literature Search: G.K.D., M.M.B., E.E., İ.K.B., Writing: G.K.D., M.M.B., E.E., İ.K.B.

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

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

References

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med 2020; 382: 727-33.
2. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet 2020; 395: 565-74.
3. Peiris JS, Guan Y, Yuen KY. Severe acute respiratory syndrome. Nat Med 2004; 10(12 Suppl): S88-97.
4. Zaki AM, van Boheemen S, Bestebroer TM, Osterhaus AD, Fouchier RA. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N Engl J Med 2012; 367: 1814-20.
5. Sabino-Silva R, Jardim ACG, Siqueira WL. Coronavirus COVID-19 impacts to dentistry and potential salivary diagnosis. Clin Oral Investig 2020; 24: 1619-21.
6. He F, Deng Y, Li W. Coronavirus disease 2019: What we know? J Med Virol 2020; 92: 719-25.
7. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, et al. Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. JAMA 2020; 323: 1610-2.
8. Cheng AC, Williamson DA. An outbreak of COVID-19 caused by a new coronavirus: what we know so far. Med J Aust 2020; 212: 393-4.e1.
9. He X, Lau EHY, Wu P, Deng X, Wang J, Hao X, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. Nat Med 2020; 26: 672-5.
10. Lavezzo E, Franchin E, Ciavarella C, Cuomo-Dannenburg G, Barzon L, Del Vecchio C, et al. Suppression of a SARS-CoV-2 outbreak in the Italian municipality of Vo'. Nature 2020; 584: 425-9.
11. Gamio L. The workers who face the greatest coronavirus risk. The New York Times (New York) 2020 March 15. Available from URL: https://www.nytimes.com/interactive/2020/03/15/business/economy/coronavirus-worker-risk.html. Last Accessed: 15 Mar, 2020.
12. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect 2020; 104: 246-51.
13. Xu J, Li Y, Gan F, Du Y, Yao Y. Salivary Glands: Potential Reservoirs for COVID-19 Asymptomatic Infection. J Dent Res 2020; 99: 989.
14. To KK, Tsang OT, Yip CC, Chan KH, Wu TC, Chan JM, et al. Consistent Detection of 2019 Novel Coronavirus in Saliva. Clin Infect Dis 2020; 71: 841-3.
15. The American Dental Association. ADA Recommending Dentists Postpone Elective Procedures. Available online: https://tinyurl.com/wpp647r (accessed on 16 March 2020).
16. Centers for Disease Control and Prevention. CDC Recommendation: Postpone Non- Urgent Dental Procedures, Surgeries, and Visits. Available online: https://www.cdc.gov/oralhealth/infectioncontrol/statement-COVID.html (accessed on 27 March 2020).
17. Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. Lancet Psychiatry 2020; 7: 228-9.
18. Liu S, Yang L, Zhang C, Xiang YT, Liu Z, Hu S, et al. Online mental health services in China during the COVID-19 outbreak. Lancet Psychiatry 2020; 7: e17-8.
19. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther 1995; 33: 335-43.
20. Hekimoglu L, Altun ZO, Kaya EZ, Bayram N, Bilgel N. Psychometric properties of the Turkish version of the 42 item Depression Anxiety Stress Scale (DASS-42) in a clinical sample. Int J Psychiatry Med 2012; 44: 183-98.
21. Bastien CH, Vallières A, Morin CM. Validation of the Insomnia Severity Index as an outcome measure for insomnia research. Sleep Med 2001; 2: 297-307.
22. Boysan M, Gülec M, Besiroglu L, Kalafat T. Psychometric properties of the Insomnia Severity Index in Turkish sample. Anadolu Psikiyatri Derg 2010; 11: 248-52.
23. Shacham M, Hamama-Raz Y, Kolerman R, Mijiritsky O, Ben-Ezra M, Mijiritsky E. COVID-19 Factors and Psychological Factors Associated with Elevated Psychological Distress among Dentists and Dental Hygienists in Israel. Int J Environ Res Public Health 2020; 17: 2900.
24. Uçan Yarkaç F, Tekin Atay Ü, Dinçer NN, Öncü E. Evaluation of dentists' stress and anxiety levels in the COVID-19 pandemic. Int Dent Res 2021;11(Suppl 1): 259-65.

25. Özarslan M, Caliskan S. Attitudes and predictive factors of psychological distress and occupational burnout among dentists during COVID-19 pandemic in Turkey. Curr Psychol 2021; 40: 3113-24.
26. Sarialioglu Gungor A, Donmez N, Uslu YS. Knowledge, stress levels, and clinical practice modifications of Turkish dentists due to COVID-19: a survey study. Braz Oral Res 2021; 35: e048.
27. Kumar Anil RN, Karumaran SC, Kattula D, Thavaeajah R, Anusa AM. Perceived stress and psychological (dis) stress among Indian endodontists during COVID-19 pandemic lock down. MedRxiv 2020. Doi: doi.org/10.1101/2020.05.06.20092601
28. Yu J, Hua F, Shen Y, Haapasalo M, Qin D, Zhao D, et al. Resumption of Endodontic Practices in COVID-19 Hardest-Hit Area of China: A Web-based Survey. J Endod 2020; 46: 1577-83.e2.
29. Dziedzic A, Tanasiewicz M, Tysiąc-Miśta M. Dental Care Provision during Coronavirus Disease 2019 (COVID-19) Pandemic: The Importance of Continuous Support for Vulnerable Patients. Medicina (Kaunas) 2020; 56: 294.
30. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Brain Behav Immun 2020; 88: 901-7.
31. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open 2020; 3: e203976.
32. Elbay RY, Kurtulmuş A, Arpacıoğlu S, Karadere E. Depression, anxiety, stress levels of physicians and associated factors in Covid-19 pandemics. Psychiatry Res 2020; 290: 113130.
33. Fleisher LA, Sweeney RE, Clapp JT, Barsade SG. Managing anxiety in anesthesiology and intensive care providers during the Covid-19 pandemic: an analysis of the psychosocial response of a front-line department. Nejm Catalyst Innovations in Care Delivery 2020; 8.
34. Wang W, Tang J, Wei F. Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. J Med Virol 2020; 92: 441-7.
35. Paulus MP, Stein MB. Interoception in anxiety and depression. Brain Struct Funct 2010; 214: 451-63.
36. Robinson MS, Alloy LB. Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. Cognit Ther Res 2003; 27: 275-91.
37. Neelam K, Duddu V, Anyim N, Neelam J, Lewis S. Pandemics and pre-existing mental illness: A systematic review and meta-analysis. Brain Behav Immun Health 2021; 10: 100177.