ORIGINAL RESEARCH

Health Science Reports $_{\text{Open Access}}$ WILEY

The psychological toll of the COVID-19 pandemic on dental care providers in Iran: A multicenter cross-sectional study

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Abstract

Background/Purpose: The COVID-19 pandemic affects social and psychological resources. Healthcare workers, especially dental personnel, are more at risk for mental issues due to anxiety, pressure, and frustration. This study assessed mental health outcomes during the COVID-19 epidemic among Iranian dental care providers, focusing on insomnia, anxiety, depression, and posttraumatic stress disorder (PTSD).

Methods: In this multicenter cross-sectional survey, the Insomnia Severity Index, the Hospital Anxiety and Depression Scale, and the Global Psychotrauma Screening were masured. Six hundred thirty-eight dental care providers (dental specialists, general dentists, dental hygienists, dental assistants, and dental students) from different parts of Iran (Tehran, Shiraz, Tabriz, and Mashhad) were investigated by the stratified sampling method. The univariate analysis was incorporated as independent in binary logistic regression models to analyze the data. In this study, the significance level was set at 0.05.

Results: Among all the participants, 42.8% were dental students or residents, 21.9% were general or specialist dentists, 18.7% were dental assistants, and 16.6% were nonclinicians. The prevalence of insomnia, anxiety, and depression was 31.3%, 40.8%, and 54.9%, respectively. The frequency of participants in the low, moderate, and high levels of PTSD resulting from LCA 56.6%, 33.7%, and 9.7%, respectively.

Conclusions: This study found a significant frequency of mental health issues among Iranian dentists. Females, participants whose relatives have COVID-19, and those with a higher workload were more likely to develop mental health symptoms. As mental problems among dental professionals might affect the quality of patient care, diagnostic, supportive, and therapeutic interventions should be taken.

KEYWORDS
anxiety, COVID-19, dentistry, depression, mental health

1 | INTRODUCTION

The severe acute respiratory syndrome caused by the coronavirus first appeared in Wuhan, China, in December 2019. The World Health Organization (WHO) proclaimed the 2019 coronavirus disease (COVID-19) a global pandemic on March 11, 2020.[1] Iran is among the nations hit most by the COVID-19 outbreak. On February 19, 2020, Iran confirmed the first COVID-19 instances.[2,3] In March 2020, Iran announced their first peak in cases.[2] Since then, six other peaks have been officially reported in Iran.

The COVID-19 pandemic has significantly strained the population's social, economic, and, most importantly, psychological resources, and it is one of the most stressful occurrences in recent history.[4–6] Evidence from past and present pandemics suggests that the spread of highly contagious diseases may seriously affect mental health, with patients and healthcare providers reporting elevated anxiety and stress levels.[5–7] Because of global pandemics, medical professionals worldwide are continually stressed by various sources, including fear of infection, experiencing frustration, tiredness, and social isolation.[8] In the current COVID-19 pandemic, healthcare workers (HCWs) are at an increased risk of experiencing emotional distress due to factors such as their exposure to the virus, worry about infecting and caring for their loved ones, lack of personal protective equipment (PPE), increased work hours and shifts, and involvement in empathetically and ethically fraught resource-allocation decisions.[9] According to previous research, a significant portion of frontline HCWs who are involved in diagnosing, treating, or care-providing processes of patients with suspected or confirmed COVID-19 suffer depression, anxiety, insomnia, and distress.[10] Evidence suggests that the COVID-19 pandemic affected the mental health of HCWs beyond only those working on the front lines. HCWs across a wide range of specialties and with different levels of exposure to the COVID-19 virus have reported experiencing anxiety, despair, discomfort, and sleep problems.[11] Besides, evaluating these symptoms in HCWs and medical sciences students is essential to ensure a good level of mental health for them to achieve good working standards and increase the efficiency of the healthcare system in case of emergencies such as pandemics.[12]

The National Task Force Against Coronavirus (NTFC) of Iran provided instructions on the closure of dental services except for emergency services, which led to the closure of many dental care centers. Due to the prolongation of the pandemic, strict protocols for providing dental services were introduced by various international organizations and NTFC to decrease the risk of transmission, which is described as the most dangerous profession for COVID-19 transmission.[13] Over time, vaccination of the medical staff and the general population began, leading to the resumption of activities by government centers, dental faculties, and private centers. Most Iranian dentists (70%) did not undertake elective treatments during the COVID-19 pandemic, and 95% had altered their working hours.[14]

Due to the possible high risk of contagion when performing routine dental procedures, there is an intimate connection between the fear of contracting an illness and psychological stress and anxiety.

Understanding how the epidemic has affected dental staff psychologically is crucial for providing the best possible patient care and ensuring an acceptable level of mental health for dental care providers. Studies in Norway and China have been conducted to investigate the mental health of dental care providers. However, further research is still needed to investigate COVID-19-related concerns and emotional responses among dental personnel from various cultures and populations.[15,16] This study evaluated mental health outcomes during the COVID-19 pandemic among dental care providers in Iran by focusing on their insomnia, anxiety, depression, and posttraumatic stress disorder (PTSD) symptoms. As far as we know, no other study has yet tried to evaluate the impact of COVID-19 on the mental health of dental care providers in Iran.

2 | METHODS

2.1 | Ethical consideration

Shiraz University of Medical Sciences approved the procedure and the informed consent forms (IR. SUMS. DENTAL. REC.1401.052). Written informed consent was obtained from the participants before completing the questionnaire form. The basis for voluntary involvement was based on signed informed consent.

2.2 | Study design and participants

A cross-sectional multicentral survey was conducted using anonymous questionnaires from August 2022 to September 2022. After obtaining approval from the ethics committee, the study investigated 638 dental care providers (dental specialists, general dentists, dental hygienists, dental assistants, and dental students) from different parts of Iran (Tehran, Shiraz, Tabriz, and Mashhad) by the stratified sampling method. A trained interviewer who was a dental staff, by referring to the dental clinics (private and governmental) and schools of dentistry, interviewed the dental care providers to complete the structured questionnaire. The eligibility criteria were writing an informed consent, voluntary participation, and Iranian citizenship. Participants under 18, had a history of mental illness, or gave exactly the same answer to each item in the questionnaire were excluded from the study.

2.3 | Questionnaire

The questionnaire was composed of two parts: 23 questions at the beginning of the questionnaire to collect demographic information, including age, gender, occupation (general dentist, specialized dentist, dental hygienist, dental assistant, or dental student), age, marital status, level of education, living with a child under 10 years old, living with a person older than 60 years, participants' history of COVID-19 infection, history of first-degree relatives COVID-19 infection,

history of first-degree relatives or colleagues death due to the COVID-19, and the number of participants' consecutive working shifts per day.

The scales consisted of the Insomnia Severity Index (ISI), the Hospital Anxiety and Depression Scale (HADS), and the Global Psychotrauma Screening (GPS) questionnaire. The HADS questionnaire includes two subscales for measuring depression and anxiety, with specific cutoff points for both subscales. This questionnaire was introduced in 1983 by Zigmond et al.[17] The validity and reliability of this scale in the Iranian clinical population were approved by Kaviani et al.[18] The ISI questionnaire was introduced in 1993 by Morin CM.[19] The validity and reliability of this scale in the Iranian population were approved by Yazdi et al.[20] GPS questionnaire evaluates PTSD symptoms and has reported satisfying psychometric properties among many different Iranian populations.[20]

2.4 | Statistical analysis

To the best of our knowledge, the GPS questionnaire does not provide a reference value for the severity of PTSD. Clusters of PTSD severity were extracted with partition around medoids (PAM). For data clustering, the PAM algorithm first finds a subset of items typical of the whole (k medoids), then places each individual object within its nearest medoid. Its goal is to reduce the overall degree of dissimilarity between items in a cluster and the cluster's nucleus (medoid). The fact that it is less vulnerable to outliers makes it a more robust form of k-means.

The original projection of the dimensions was a scale from 0 to 100. Slips, deliberate violations, lapses, and unintentional violations were then accounted for using PAM on the estimated dimensions. The optimal number of clusters was identified using clustering validity indices and measures of stability. Clusters with the highest values for the Silhouette and Calinski–Harabsz indices of internal clustering validity are the most distinct and compact. Clusters are stable and will not be severely impacted by removing variables, as measured by minimum values of the average proportion of nonoverlap (APN) and the average distance between means (ADM) (dimensions). The APN evaluates the average proportion of observations not allocated in the same cluster by clustering based on the full data versus clustering based on the data with a single column removed. When clustering based on the complete data and clustering based on the data with one dimension removed, the ADM measure calculates the average distance between cluster centers for observations placed in the same cluster. Finally, the PTSD severity levels were grouped into three categories.

The data was analyzed using social science statistical software (IBM SPSS Statistics 25). Specific factors from the univariate analysis were included as independent variables in binary logistic regression models ($p < 0.10$) to further investigate putative stressors' influence. Multiple clinic kinds and other dummy variables were established. As necessary, potential confounding variables (such as gender, marital status, age, etc.) were controlled. To verify statistical validity, a two-tailed test was performed with a significance level of 0.05.

3 | RESULTS

The study sample comprised 638 (254 females and 384 males) dental care providers from different parts of Iran (Tehran, Shiraz, Tabriz, and Mashhad). The mean age of participants was 30.76 ± 18, and about 95% were <50 years. Out of all participants, 273 (42.8%) were dental students or residents, 140 (21.9%) were general or specialist dentists, 119 (18.7%) were dental assistants, and 106 (16.6%) were non-clinicians. The prevalence of insomnia, anxiety, and depression was 31.3%, 40.8%, and 54.9%, respectively. The frequency of participants in the low, moderate, and high levels of PTSD resulting were 361 (56.6%), 215 (33.7%), and 62 (9.7%), respectively. The reliability of HADS, ISI, and GPS questionnaires were 0.870, 0.914, and 0.840, respectively.

3.1 | Insomnia

The logistic regression model results for predictors affecting insomnia are presented in Table 1. The results of the full model indicated that female gender (odds ratio [OR] = 1.69, 95% confidence interval [CI]: 1.17–2.44), age group of <50 years (OR = 2.92, 95% CI: 1.08–7.85), negative history of COVID-19 infection in the relatives (OR = 2.43, 95% CI: 1.64–3.60), and positive history of death from COVID-19 in the relatives (OR = 2.08, 95% CI: 1.12–3.86) were significantly associated with the presence of insomnia. After performing the variable selection technique, the reduced model showed that those who were female (OR = 1.83; 95% CI: 1.29–2.60), aged <50 years old (OR = 2.66; 95% CI: 1.04–6.81), had a negative history of COVID-19 infection in their relatives (OR = 2.38; 95% CI: 1.64–3.43), and had experienced death from COVID-19 in the relatives (OR = 2.45; 95% CI: 1.38–4.35) were more likely to suffer from insomnia.

3.2 | Anxiety

Table 2 shows the results of logistic regression models to examine the effects of predictors on anxiety. The full model indicated that gender (female to male: OR = 1.57, 95% CI: 1.11–2.23), occupation (dentists to nonclinicians: OR = 2.14, 95% CI: 1.21–3.78), and death from COVID-19 in the relatives (yes to no: OR = 2.07, 95% CI: 1.12–3.80) were significantly associated with anxiety. However, the reduced model only included gender and death from COVID-19 in the relatives: Females were 1.63 times more likely to have anxiety than males (95% CI: 1.18–2.27), and participants who experienced death from COVID-19 in the relatives were 2.47 times more likely to have anxiety than those not experienced it (95% CI: 1.41–4.33).

TABLE 1 Association between demographic factors and COVID-19 features with insomnia based on multiple logistic regression.

Variable	Insomnia		OR[a] (95% CI)	p Value	OR[b] (95% CI)	p Value
	No	Yes				
Gender						
M	285 (74.2)	99 (25.8)	1	-	1	-
F	153 (60.2)	101 (39.8)	1.69 (1.17–2.44)	0.005	1.83 (1.29–2.60)	0.001
Age						
<50	413 (68.0)	123 (48.4)	2.92 (1.08–7.58)	0.034	2.66 (1.04–6.81)	0.042
≥50	247 (64.3)	137 (35.7)	1	-	1	-
Marital status						
Single	98 (38.6)	156 (6.4)	1.32 (0.86–2.03)	0.197		
Married	190 (49.5)	194 (50.5)	1	-		
Level of education						
Nonacademic	44 (78.6)	12 (21.4)	0.63 (0.30–1.32)	0.219		
Academic	394 (67.7)	188 (32.3)	1	-		
Living with children (<10 years old)						
No	306 (68.6)	140 (31.4)	1	-		
Yes	132 (68.8)	60 (31.3)	0.96 (0.61–1.49)	0.840		
Living with the elderly (>60 years old)						
No	334 (68.0)	157 (32)	1	-		
Yes	104 (70.7)	43 (29.3)	1.25 (0.80–1.93)	0.325		
Occupation						
Dental student	185 (67.8)	88 (32.2)	1.06 (0.59–1.91)	0.836		
Dentist	84 (60.0)	56 (40.0)	1.60 (0.88–2.91)	0.119		
Dental assistant	93 (78.2)	26 (21.8)	0.81 (0.42–1.55)	0.521		
Nonclinicians	76 (71.7)	30 (28.3)	1	-		
Working shift						
One	249 (70.5)	104 (29.5)	1.06 (0.28–1.53)	0.769		
Two	189 (66.3)	96 (33.7)	1	-		
Participants' history of COVID-19 infection						
No	154 (67.0)	76 (33.0)	1.13 (0.7–1.67)	0.554		
Yes	284 (69.6)	124 (30.4)	1	-		
History of COVID-19 infection in the relatives						
No	105 (55.9)	83 (44.1)	2.43 (1.64–3.60)	<0.001	2.38 (1.64–3.43)	<0.001
Yes	333 (74.0)	117 (26.0)	1	-	1	-
Death from COVID-19 in the relatives						
No	407 (70.2)	173 (29.8)	1	-	1	-
Yes	31 (53.4)	27 (46.6)	2.08 (1.12–3.86)	0.020	2.45 (1.38–4.35)	0.002
Death from COVID-19 in the colleagues						
No	366 (70.8)	151 (29.2)	1	-		
Yes	72 (59.5)	49 (40.5)	1.55 (0.98–2.46)	0.059		

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]OR resulted from the full model; the model included all predictors.

[b]OR resulted from the reduced model; model based on stepwise selection method.

TABLE 2 Association between demographic factors and COVID-19 features with anxiety based on multiple logistic regression.

| | Anxiety | | | | | |
	No	Yes	OR[a] (95% CI)	p Value	OR[b] (95% CI)	p Value
Gender						
M	247 (64.3)	137 (35.7)	1	-	1	-
F	131 (51.6)	123 (48.4)	1.57 (1.11–2.23)	0.011	1.64 (1.18–2.27)	0.003
Age						
<50	358 (59.0)	249 (41.0)	1.51 (0.65–3.51)	0.337		
≥50	20 (64.5)	11 (35.5)	1	-		
Marital status						
Single	208 (57.6)	153 (42.4)	1.49 (1.00–2.22)	0.052		
Married	20 (64.5)	11 (35.5)	1	-		
Level of education						
Nonacademic	31 (55.4)	25 (44.6)	1.52 (0.82–2.84)	0.187		
Academic	347 (59.6)	235 (40.4)	1	-		
Living with children (<10 years old)						
No	276 (61.9)	170 (38.1)	1	-		
Yes	102 (53.1)	90 (46.9)	0.71 (0.47–1.07)	0.100		
Living with the elderly (>60 years old)						
No	293 (59.7)	198 (40.3)				
Yes	85 (57.8)	62 (42.2)	1.08 (0.72–1.62)	0.706		
Occupation						
Dental student	166 (60.8)	107 (39.2)	1.44 (0.82–2.51)	0.202		
Dentist	68 (48.6)	72 (51.4)	2.14 (1.21–3.78)	0.009		
Dental assistant	74 (62.2)	45 (37.8)	1.54 (0.85–2.76)	0.151		
Nonclinicians	70 (66.0)	36 (34.0)	1	-		
Working shift						
One	220 (62.3)	133 (37.7)	1	-		
Two	158 (55.4)	127 (44.6)	1.17 (0.83–1.65)	0.371		
Participants' history of COVID-19 infection						
No	147 (63.9)	83 (36.1)	0.81 (0.56–1.18)	0.275		
Yes	231 (56.6)	177 (43.4)	1	-		
History of COVID-19 infection in the relatives						
No	110 (58.5)	78 (41.5)	1.16 (0.79–1.70)	0.439		
Yes	268 (59.6)	182 (40.4)	1	-		
Death from COVID-19 in the relatives						
No	356 (61.4)	224 (38.6)	1	-	1	-
Yes	22 (37.9)	36 (62.1)	2.07 (1.12–3.80)	0.020	2.47 (1.41–4.33)	0.002
Death from COVID-19 in the colleagues						
No	320 (61.9)	197 (38.1)	1	-		
Yes	58 (47.9)	63 (52.1)	1.45 (0.94–2.24)	0.091		

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]OR resulted from the full model; the model included all predictors.

[b]OR resulted from the reduced model; model based on stepwise selection method.

3.3 | Depression

The results of full and reduced logistic regression models for depression as a dependent variable are displayed in Table 3. The full model showed that only experiencing death from COVID-19 in the relatives (OR = 2.01, 95% CI: 1.06–3.82) significantly contributed to depression. However, the reduced model indicated that gender and death from COVID-19 in the relatives were significantly associated with depression. Females and those who experienced death from COVID-19 in the relatives were 1.51 (95% CI: 1.10–2.10) and 2.21 (95% CI: 1.17–4.03) times more likely to present depression symptoms than males, and those who did not experience death from COVID-19 in relatives, respectively.

3.4 | PTSD

Table 4 displays the results of multinomial logistic regression models to assess the effect of predictors on the three levels of PTSD. Females (OR = 1.97, 95% CI: 1.06–3.67), dental assistants (OR = 3.20, 95% CI: 1.15–8.94), those working two consecutive shifts per day (OR = 2.05, 95% CI: 1.12–3.76), those who had a history of COVID-19 infection in the relatives (OR = 3.05, 95% CI: 1.41–6.58), and those who had a history of death from COVID-19 in the relatives (OR = 4.52, 95% CI: 2.02–10.20) had a higher odd of being included in the high level of PTSD symptoms. However, in the reduced model, gender and occupation were not still significantly associated with the high level of PTSD. It was shown that those working two consecutive shifts per day were 1.98 times (95% CI: 1.12–3.52) more likely to present a high level of PTSD symptoms. Moreover, those who experienced a history of COVID-19 infection and death from COVID-19 in their relatives were 2.89 (95% CI: 1.39–6.02) and 5.59 (95% CI: 2.69–11.49) times more likely to show high levels of PTSD.

According to Table 5, both full and reduced models showed that gender, working shift, and history of COVID-19 infection in the relatives were significantly associated with moderate PTSD levels. In contrast to the highest level of PTSD, females (OR = 0.35, 95% CI: 0.24–0.52, and those working one shift per day (OR = 0.69, 95%CI: 0.48–0.99) were less likely to be in the moderate level. Moreover, those who experienced death from COVID-19 in the relatives were still more likely to show moderate levels of PTSD (OR = 2.04, 95%CI: 1.37–3.06).

4 | DISCUSSION

In this multicentric cross-sectional study, the prevalence of insomnia, anxiety, depression, and moderate to high levels of PTSD symptoms among dental health providers was estimated at 31.3%, 40.8%, 54.9%, and 43.4%, respectively. A 2022 study conducted by Maroufizadeh et al. reported the prevalence of anxiety and depression at 30.1% and 33.4%, respectively, among the general Iranian population.[21] These results indicate that the prevalence of

psychiatric symptoms among dental care providers is relatively high compared to the general population of Iran. Dental care providers probably share many of the same concerns as other HCWs regarding the COVID-19 pandemic, which can explain their relatively high levels of mental health symptoms compared to the general population. These concerns can include their closer exposure to the virus, fear of morbidity or mortality due to being infected by COVID-19, transmitting the disease to their loved ones and relatives, and unavailability of enough PPE.[9]

Some notable results can be found in comparing the prevalence of mental health outcomes between HCWs and dental care providers, who are actually a part of the larger community of HCWs. Regarding the variable of insomnia, it can be seen that the prevalence obtained among dental service providers in the current study is slightly lower than the 34% prevalence reported among Chinese HCWs in the study of Lai et al. and the 38% and 36.36% prevalence reported in meta-analyses conducted by Pappa et al. and Sahebi et al. respectively.[10,22,23] In the case of anxiety, it can also be observed that the prevalence obtained in this study is lower than the prevalence reported in the studies of Hassannia et al. (68%) and Azizi et al. (43%) on the Iranian HCWs.[24,25] On the other hand, the prevalence of depression in this study was higher compared to the two studies conducted by Hasannia et al. (51.72%) and Azizi et al. (44.8%). Regarding moderate to high levels of PTSD, just like insomnia and anxiety, the prevalence rate obtained among dental care providers in this study is lower compared to studies on HCWs conducted by Lai et al. (71.5%), Lasalvia et al. (53.8%), and Rossi et al. (49.38%).[10,26,27] The longer time interval of conducting this study from the beginning of the COVID-19 pandemic, compared to the other mentioned studies, is probably due to the increase in the information about the nature of the virus and the higher availability of PPE. The general population vaccination rate increase, can explain the lower prevalence of mental health symptoms such as insomnia, anxiety, and PTSD.[28] On the other hand, issues such as the lack of a clear vision of the definitive end of the pandemic, fear of the emergence of new variants of the virus, and the continuation of some social distancing restrictions may be counted among the reasons for the prevalence of depression to remain high.

Comparing mental health outcomes prevalence in this study with other studies, which evaluated specifically the dental care providers in other parts of the world, provides different results. While the results obtained in a 2021 study in China (anxiety prevalence: 36.3% and depression prevalence: 46.4%) are relatively close to the results obtained in the present study, another study in the United Kingdom estimated a much higher prevalence (anxiety prevalence: 71% and depression prevalence: 60%).[29,30] The reason for this variance may be the difference in the amount and quality of the PPEs provided for the dental service providers, different levels of vaccination against COVID-19, and the prevalence of COVID-19 in the time frame of conducting each study in each country.

In this study, based on the full logistic regression model, female gender, younger age, negative history of COVID-19 infection in relatives, and experiencing the death of relatives due to COVID-19

TABLE 3 Association between demographic factors and COVID-19 features with depression based on multiple logistic regression.

	Depression		OR[a] (95% CI)	p Value	OR[b] (95% CI)	p Value
	No	Yes				
Gender						
M	190 (49.5)	194 (50.5)	1	-	1	-
F	98 (38.6)	156 (61.4)	1.37 (0.97–1.94)	0.071	1.51 (1.10–2.10)	0.012
Age						
<50	273 (45.0)	334 (55.0)	1.40 (0.63–3.09)	0.406		
≥50	15 (48.4)	16 (51.6)	1	-		
Marital status						
Single	161 (44.6)	200 (55.4)	1.24 (0.84–1.82)	0.279		
Married	127 (45.8)	150 (54.2)	1	-		
Level of education						
Nonacademic	29 (51.8)	27 (48.2)	0.66 (0.36–1.21)	0.178		
Academic	259 (44.5)	323 (55.5)	1	-		
Living with children (<10 years old)						
No	209 (46.9)	237 (53.1)	1	-		
Yes	79 (41.4)	113 (58.9)	0.81 (0.54–1.21)	0.295		
Living with the elderly (>60 years old)						
No	221 (45.0)	270 (55.0)	1	-		
Yes	67 (45.6)	80 (54.4)	1.10 (0.74–1.63)	0.638		
Occupation						
Dental student	128 (46.9)	145 (53.1)	0.73 (0.43–1.25)	0.256		
Dentist	54 (38.6)	86 (61.4)	0.90 (0.52–1.57)	0.711		
Dental assistant	63 (52.9)	56 (47.1)	0.65 (0.37–1.14)	0.137		
Nonclinicians	43 (40.6)	63 (59.4)	1	-		
Working shift						
One	173 (49.0)	180 (51.0)	1	-		
Two	115 (40.4)	170 (59.6)	1.31 (0.94–1.83)	0.115		
Participants' history of COVID-19 infection						
No	107 (46.5)	123 (53.5)	0.94 (0.66–1.34)	0.731		
Yes	181 (44.4)	227 (55.6)	1	-		
History of COVID-19 infection in the relatives						
No	75 (39.9)	113 (60.1)	1.43 (0.98–2.08)	0.060		
Yes	213 (47.3)	237 (52.7)	1	-		
Death from COVID-19 in the relatives						
No	272 (46.9)	308 (53.1)	1	-	1	-
Yes	16 (27.6)	42 (72.4)	2.01 (1.06–3.82)	0.033	2.21 (1.17–4.03)	0.010
Death from COVID-19 in the colleagues						
No	243 (47.0)	274 (53.0)	1	-		
Yes	45 (37.2)	76 (62.8)	1.24 (0.80–1.93)	0.326		

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]OR resulted from the full model; the model included all predictors.

[b]OR resulted from the reduced model; model based on stepwise selection method.

TABLE 4 Association between demographic factors and COVID-19 features with the level of PTSD based on multinomial logistic regression (full model).

	PTSD level			OR[a] (95% CI)	p Value	OR[b] (95% CI)	p Value
	L	M	H				
Gender							
M	195 (50.8)	165 (43.0)	24 (6.2)	1	-	1	-
F	166 (65.3)	50 (19.7)	38 (15.0)	1.97 (1.06–3.67)	0.032	0.35 (0.23–0.52)	<0.001
Age							
<50	341 (56.2)	207 (34.1)	59 (9.7)	2.18 (0.50–9.46)	0.296	1.21 (0.48–3.05)	0.681
≥50	20 (64.5)	8 (25.8)	3 (9.7)	1	-	1	-
Marital status							
Single	196 (54.3)	129 (35.7)	36 (10.0)	1.81 (0.88–3.73)	0.109	1.21 (0.79–1.85)	0.391
Married	165 (59.6)	86 (31.0)	26 (9.4)	1	-	1	-
Level of education							
Nonacademic	34 (60.7)	16 (28.6)	6 (10.7)	1.16 (0.41–3.28)	0.755	0.91 (0.45–1.84)	0.803
Academic	327 (56.2)	199 (34.2)	56 (9.6)	1	-	1	-
Living with children (<10 years old)							
No	253 (56.7)	157 (35.2)	36 (8.1)	1	-	1	-
Yes	108 (56.3)	58 (30.2)	26 (13.5)	0.72 (0.36–1.45)	0.354	1.06 (0.68–1.65)	0.801
Living with the elderly (>60 years old)							
No	280 (57.0)	170 (34.6)	41 (8.4)	1	-	1	-
Yes	81 (55.1)	45 (30.6)	21 (14.3)	0.76 (0.40–1.44)	0.397	1.11 (0.71–1.75)	0.638
Occupation							
Dental student	154 (56.4)	98 (35.9)	21 (7.7)	1.43 (0.51–4.00)	0.493	1.53 (0.74–2.78)	0.163
Dentist	79 (56.4)	42 (30.0)	19 (13.6)	1.81 (0.67–4.88)	0.242	1.18 (0.63–2.21)	0.613
Dental assistant	58 (48.7)	47 (39.5)	14 (11.8)	3.20 (1.15–8.94)	0.026	1.64 (0.87–3.06)	0.123
Nonclinicians	70 (66.0)	28 (26.4)	8 (7.5)	1	-	1	-
Working shift							
One	213 (60.3)	114 (32.3)	26 (7.4)	1	-	1	-
Two	148 (51.9)	101 (35.4)	36 (12.6)	2.05 (1.12–3.76)	0.020	1.57 (1.07–2.28_	0.020
Participants' history of COVID-19 infection							
No	147 (63.9)	64 (27.8)	19 (8.3)	1.01 (0.53–1.94)	0.977	0.67 (0.45–1.01)	0.052
Yes	214 (52.5)	151 (37.0)	43 (10.5)	1	-	1	-
History of COVID-19 infection in the relatives							
No	132 (70.2)	46 (24.5)	10 (5.30	0.33 (0.15–0.71)	0.004	0.55 (0.36–0.85)	0.006
Yes	229 (50.9)	169 (37.6)	52 (11.6)	1	-	1	-
Death from COVID-19 in the relatives							
No	341 (58.8)	195 (33.6)	44 (7.6)	1	-	1	-
Yes	20 (34.5)	20 (34.5)	18 (31.0)	4.52 (2.02–10.20)	<0.001	1.69 (0.84–3.44)	0.144
Death from COVID-19 in the colleagues							
No	305 (59.0)	171 (33.1)	41 (7.9)	1	-	1	-
Yes	56 (46.3)	44 (36.4)	21 (17.4)	1.74 (0.88–3.44)	0.114	1.37 (0.84–2.23)	0.204

Note: PTSD levels: High (H), Moderate (M), and low (L).

Abbreviations: CI, confidence interval; OR, odds ratio; PTSD, posttraumatic stress disorder.

[a]OR examining the likelihood of a high level of PTSD to low.

[b]OR examining the likelihood of a medium level of PTSD to low.

TABLE 5 The results of the stepwise selection method to evaluate the association between demographic factors and COVID-19 features with PTSD.

	OR[a] (95% CI)	p Value	OR[b] (95% CI)	p Value
Gender				
M	1	-	1	
F	1.66 (0.94–2.96)	0.082	0.35 (0.24–0.51)	<0.001
Working shift				
One	1	-	1	-
Two	1.98 (1.12–3.52)	0.019	1.44 (1.01–2.06)	0.045
History of COVID-19 in the relatives				
No	0.35 (0.17–0.72)	0.005	0.49 (0.33–0.73)	0.001
Yes	1	-	1	-
Death from COVID-19 in the relatives				
No	1	-	1	-
Yes	5.59 (2.69–11.49)	<0.001	1.74 (0.89–3.40)	0.104

Abbreviations: CI, confidence interval; OR, odds ratio; PTSD, posttraumatic stress disorder.

[a]OR examining the likelihood of a high level of PTSD to low.

[b]OR examining the likelihood of a medium level of PTSD to low.

were found as associated factors with more insomnia symptoms in dental service providers. The association of the insomnia level with the female gender is consistent with previous studies.[31,32] Besides, experiencing the death of relatives due to COVID-19 can impose a psychological burden on the person, which can explain its association with higher insomnia levels in this study.[32] Regarding the relationship between insomnia and age, although most of the studies conducted before the COVID-19 pandemic considered older age to be an aggravating factor for insomnia, this study and Wang et al.'s study in China during the COVID-19 pandemic found younger age as an associated factor with insomnia.[31,32] However, the unexpected fact in this study was the significant association between the negative history of COVID-19 infection in participants' relatives and more insomnia symptoms.

Based on the logistic regression model, it was found that the female gender experiencing death from COVID-19 in the relatives had significant associations with presenting more anxiety symptoms. The relationship between higher levels of anxiety and female gender is well-established in the literature, and this relationship remained unchanged in the studies conducted during the COVID-19 pandemic.[10,25,27] Moreover, experiencing the death of relatives is a factor that can lead to complicated or prolonged grief, which can cause more anxiety symptoms.[33]

Just same to anxiety, female gender and history of death from COVID-19 in relatives had a significant association with higher depression levels among dental care providers, based on the logistic regression model. The association of female gender and more depressive symptoms is congruent with the findings of previous studies conducted on HCWs.[4,10,25–27] In addition, similar to anxiety,

since the death of loved ones can cause psychological pressure on participants, the relationship of this factor with the increase in depression symptoms can be justified.[34]

Finally, in this study, based on the logistic regression model, it was found that females gender, working two consecutive shifts per day, having a positive history of COVID-19 infection in their relatives, and experiencing death from COVID-19 in the relatives, have a significant association with moderate or high levels of PTSD symptoms among dental care providers. The association between the female gender and higher PTSD levels is consistent with previous studies.[4,10,27] Besides, working more shifts per day will cause more exposure time to the virus and increase the workload of the dental care providers, which can result in more PTSD symptoms.[35] On the other hand, a family member's infection with COVID-19, due to the requirement of quarantine or the need for hospitalization, can lead to the separation of that person from other family members, which can cause PTSD symptoms among them. Moreover, the association of the death of a loved one, which in the current study was due to the effects of the COVID-19 infection, and more PTSD symptoms are consistent with the results of previous studies.[36,37]

This study showed that Dental care providers could be subjected to notable mental health disorders and certain factors such as female gender, positive history of COVID-19 infection in the relatives, death due to COVID-19 in the relatives, and higher workload can make them prone to present more psychiatric symptoms. Besides, dental care providers are highly exposed to the risk of viral respiratory infections regarding the nature of the dental practice, in which there is constant proximity to the patient's saliva and blood. Also, using electric dental handpieces creates many aerosols that can remain

suspended in space and be sources of infection.[13,38] Furthermore, no certain protocol can completely prevent virus transmission, and a definite treatment for COVID-19 has not yet been found. All these factors show that dental care providers' mental health can be seriously vulnerable during the COVID-19 pandemic. Since the mental health disorder of this group can reduce their efficiency in providing services to patients and impair the standards of quality treatments, taking appropriate measures to prevent the occurrence of these disorders and also to help the affected personnel is of great importance.[12] Reducing work hours and limiting clinical services to emergency procedures can be useful advice for only a limited time, as they may result in financial problems.[14,39] Therefore, it seems that measures such as increasing the general vaccination rate, improving the identification system of patients infected with COVID-19, providing enough PPE, identifying HCWs at risk of developing psychiatric disorders, appreciating HCWs' efforts during the pandemic era, and providing available psychiatric and psychological services for them can be more effective and efficient.[40]

This study is conducted by a cross-sectional method; therefore, it had some inherent limitations. We did not have any data regarding baseline mental health conditions among dental care providers who participated in the study. Therefore, we could not comprehensively compare the participants' current and previous mental health conditions. Moreover, since we used physical questionnaires instead of online forms, the number of participants was limited. Meanwhile, due to in-person data gathering in the participants' workplace, the accuracy of answers and the reliability of the results appear to be more than similar studies that use online questionnaires. In addition, our study covered all sorts of dental healthcare providers, including dental specialists, general dentists, dental hygienists, dental assistants, and dental students in different cities.

5 | CONCLUSION

This study indicated a relatively high prevalence of mental health disorders among dental care providers in variant parts of Iran amid the COVID-19 pandemic. In this population, females, participants whose relatives had contracted or died of COVID-19, and those with a higher workload were at a greater risk of developing different mental health symptoms. As the occurrence of mental disorders among dental care providers can reduce the quality of the treatment and care provided to patients, appropriate diagnostic, supportive, and therapeutic measures, especially for at-risk groups, should be adopted to maintain an optimal level of mental health among these valuable human resources.

AUTHOR CONTRIBUTIONS

Morteza Banakar: Conceptualization; data curation; formal analysis; methodology; writing—original draft; Writing—review and editing. **Mehrdad Vossoughi**: Data curation; writing—original draft; Writing—review and editing. **Mani Kharrazi**: Data curation; writing—original draft; writing—review and editing. **Sedigheh Moayedi**: Data curation; writing—original draft; writing—review and editing. **Mehdi Dehghan**: Data curation; writing—original draft; writing—review and editing. **Somayeh Mansoori**: Data curation; writing—original draft; writing—review and editing. **Mohammad Salehi**: Formal analysis; writing—original draft; writing—review and editing. **Alireza Ahmadkhani**: Visualization; writing—original draft; writing—review and editing. **Seyed Taghi Heydari**: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; supervision; writing—original draft; writing—review and editing. **Kamran Bagheri Lankarani**: Conceptualization; methodology; project administration; supervision; writing—review and editing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data are available from the corresponding author upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Seyed Taghi Heydari affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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