

Analysis of Related Factors to the Anxiety State of Dental Healthcare Personnel During the COVID-19 Pandemic in Yichang, China

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Abstract

As Coronavirus Disease 2019 (COVID-19) has exerted impact on every aspect of daily life, it is important to adopt appropriate measures to cope with the situation. Since dental healthcare personnel (DHCP) are characterized with high level of stress and have the potential for exposure to infectious materials, the mental state of them requires concern. This study used two web-based questionnaires to compare the anxiety state of DHCP to that of the general public after dental settings in Yichang, China returned to a full scope of services. Subsequently, potential factors influencing the anxiety state of DHCP were analyzed. Results indicated that they were more likely to suffer from anxiety disorders than the general public were. For DHCP, those who were at a younger age, provided care without level three protective measures, had conflicts with patients or colleagues, and/or had less knowledge of COVID-19 were more prone to anxiety disorders. Practical suggestions were proposed at the end of this study to help DHCP maintain better mental health conditions. As COVID-19 continues to spread, this study could provide data support for adopting appropriate measures at dental settings.

Background

COVID-19 has had a great impact on the life of people since the first case was reported in Wuhan, China in December 2019.¹ Because of its high infection rate and severe symptoms, many cities were locked down to limit the spreading. Besides using protective measures to minimize the number of infected people, attention was paid to the mental health conditions of both healthcare workers (HCWs) and the general public.²⁻⁵ A comparison between mental status of HCWs and that of the general public in China during the outbreak of COVID-19 suggested that, for the general public, COVID-19 related knowledge, age, and the time spent on COVID-19 information were significantly associated with general anxiety disorders.⁶ However, another study asserted that the knowledge of COVID-19 helped people in China to keep positive attitudes.⁷ As for HCWs, the likelihood of them suffering from anxiety and depression disorders was higher than that of the general public during the outbreak.^{3,6} Despite the common ways of receiving information, medical professionals acquired extensive knowledge of COVID-19 from research articles and relevant trainings provided by hospitals.⁸

During the COVID-19 outbreak, dental settings in China also reacted to avoid cross-infections. Procedures with a high potential risk of infection were reduced or deferred. After the spreading of COVID-19 was curbed in China, dental clinics and stomatology departments at hospitals returned to a full scope of dental services. To assist in reopening, new national protocols were implemented, which included sterilizations of physical working environment and level three protective measures (PM-3). Such measures, adopted by DHCP and all the other HCWs, require a full set of personal protective equipment (PPE), including medical uniforms, gown, medical cap, N95 respirator, goggles, face shield, medical hazmat suit, gloves, and medical shoe covers. Constant wearing of PPE was widely reported with effectiveness but also with discomfort.⁹ Specifically, shortness of breath, skin injuries, and other skin irritations were commonly observed in frontline HCWs.⁹ Moreover, DHCP were characterized with

susceptibility to stress.¹⁰ Previous studies suggested various stress factors in dentistry work environment, such as patient relations,¹⁰ dental procedure-related factors,¹⁰ and heavy workload.¹¹ Based on current situation and earlier studies, the mental status of DHCP requires attention from dental settings that reopened.

With an approximate population of 4.1 million, Yichang is only 200 miles away from its provincial capital Wuhan, where COVID-19 was first reported in China. According to the City Health Commission of Yichang, by the twelfth of June, 931 confirmed cases and 37 deaths of COVID-19 were reported in the greater Yichang area.¹² Since April, dental settings in the area had gradually reopened. Considering its proximity to Wuhan, mental pressures on all DHCP were substantial. To provide insights to their psychological status, we compared the anxiety state of DHCP with that of the general public via Beck Anxiety Inventory (Chinese version). In this study, potential factors leading to anxiety disorders in DHCP during the pandemic were explored, aiming to provide data support for maintaining their mental health conditions.

Methods

Participants and data collection

605 people in Yichang participated in this research (305 from DHCP, and 300 from the general public). Data was collected from the 2nd of May to the 13th of May. Due to incompleteness, 25 questionnaires from DHCP and 15 from the general public were excluded, and the number of valid questionnaires were 280 and 285 respectively. The gender and age distributions among participants in the valid questionnaires by group are shown in Table 1. The general public were assessed with their anxiety state, while DHCP were required to provide more information relevant to their daily work.

Table 1
The Gender and age distributions among participants in the valid questionnaires collected.

Variable	DHCP	General Public
Gender (Percentage)		
Male	88 (31.43%)	111 (38.9%)
Female	192 (68.57)	174 (61.1)
Age		
Range	17–56	18–71
Average (SD)	27.20 (8.46)	42.19 (11.44)

Beck Anxiety Inventory

The Chinese version of Becker Anxiety Inventory (BAI) was used in this study to assess the anxiety state of both groups. BAI is a self-rated inventory with 21 items.¹³ Each item was provided with four answers of

different scores (1 = not at all, 2 = mildly, 3 = moderately, 4 = severely). The summary of scores for 21 items were applied with the formula $Y = \text{int}(1.19 * x)$ to calculate the final score for each participant.¹⁴ A participant's final score equals to or is higher than 45 would indicate he/she had anxiety disorders.¹⁴ This widely used inventory is valid and reliable.^{13,15}

Assessment of the knowledge of COVID-19

To assess the knowledge of COVID-19 for DHCP, six multiple choice questions of COVID-19 were used. These questions cover the following issues regarding COVID-19: [1] its main symptoms, [2] its incubation period, [3] its main routes of transmission, [4] the effective measures and chemical substances for cleaning and disinfection, [5] the discharging criteria for inpatients, and [6] the susceptibility of people to it. A correct answer was counted as 1 point, otherwise 0. The summary score was calculated to assess DHCP' depth of knowledge of COVID-19. For each question, there was only one correct answer among four choices.

Questions for other factors

Other questions relevant to potential factors were included in the questionnaire for DHCP. They were as follow: [1] the number of working days per week, [2] the number of working hours per day, [3] the number of working hours between breaks, [4] whether they often performed aerosolization procedures, [5] whether they had conflicts with colleagues or patients in the last six months, [6] whether they were in close contact with confirmed or suspected cases of COVID-19, [7] whether their skin or wounds were exposed to patients' blood, saliva, or other bodily fluids, and [8] whether their workplaces have PM-3 in place.

Results

Descriptive analysis

The descriptive analysis of workload among DHCP was shown in Table 2. As presented, 72.14% of them worked no more than 5 days per week, whereas 27.86% of them worked 6 to 7 days. The majority of them worked no more than 8 hours per day, but there were 12.14% of the DHCP had longer hours than the others. 70.36% of them had breaks within two hours of work, yet 29.64% had to work longer before breaks. The average score of DHCP on COVID-19 knowledge was 2.45 (SD = 1.34).

Table 2
Descriptive results of workload among DHCP.

Variable	Frequency (%)
Total	280(100.00%)
Working days per week	
0–4 days	13(4.64%)
5 days	189(67.50%)
6–7 days	78(27.86%)
Working hours per day	
<4 hours	40(14.29%)
[4, 6) hours	49(17.50%)
[6, 8) hours	157(56.07%)
≥ 8 hours	34(12.14%)
Working hours between breaks ^a	
<1 hour	74(26.43%)
[1, 2) hours	123(43.93%)
[2, 4) hours	63(22.50%)
≥ 4 hours	20(7.14%)
^a time intervals less than 5 minutes were not counted as a break	

Comparison of anxiety state between DHCP and the general public

In order to compare the anxiety state of DHCP to that of the public, a Chi-square test was carried out. There was a significant association ($\chi^2 = 30.342$, $p < 0.001$) between performing dental care and having anxiety disorders. Based on the odds ratio, the likelihood of DHCP to suffer from anxiety disorder was 4.585 (95% CI: 2.568–8.186) times higher than that of the general public.

Bivariate analysis

Firstly, the associations of several potential factors with the anxiety state of DHCP were assessed. As shown in Table 3, factors that were significantly associated to the outcome variable (the anxiety state of DHCP) included communications with colleagues and patients, being in close contact with suspected or

confirmed cases, and adopting PM-3. However, being in close contact with suspected or confirmed cases had a weak association with the outcome variable, since the Cramer's V was 0.129.

In addition, other factors that contributed to the anxiety of DHCP were also perceived in the results. Table 4 showed the Eta squared of each predictor variable. It was shown that there were four factors ([1] the number of working days in per week, [2] the number of working hours per day, [3] their knowledge of COVID-19, and [4] the number of trainings organized by workplace) that had weak association with the anxiety state of DHCP. But the age of them was moderately associated with their anxiety state.

Table 3

Associations between potential factors and anxiety disorders of DHCP (categorical variables).

Variable	Anxiety state		χ^2	Cramer's V	P- value
	Yes	No			
	(n = 60)	(n = 220)			
Gender			2.322	0.091	0.128
Male	14	74			
Female	46	146			
Aerosolization procedures ^a			0.136	0.022	0.713
Yes	44	156			
No	16	64			
Conflicts with colleagues and/or patients ^b			12.711	0.213	< 0.001
Yes	14	16			
No	46	204			
Close contact with confirmed and/or suspected cases ^c			4.634	0.129	0.031
Yes	11	19			
No	49	201			
Exposure to infectious substances ^d			3.024	0.104	0.082
Yes	18	117			
No	42	43			
PM-3 ^e			11.451	0.202	0.001

^a Did you often perform aerosolization procedures?

^b Did you have conflicts with colleagues and/or patients in the last six months?

^c Were you in close contact with confirmed and/or suspected cases of COVID-19?

^d Were your skin or wounds exposed to patients' blood, saliva, and/or other bodily fluids?

^e Does your workplace follow PM-3 protocols?

Variable	Anxiety state		χ^2	Cramer's V	P-value
Yes	43	196			
No	17	24			
^a Did you often perform aerosolization procedures?					
^b Did you have conflicts with colleagues and/or patients in the last six months?					
^c Were you in close contact with confirmed and/or suspected cases of COVID-19?					
^d Were your skin or wounds exposed to patients' blood, saliva, and/or other bodily fluids?					
^e Does your workplace follow PM-3 protocols?					

Table 4
Associations between potential factors and anxiety disorders of DHCP (scaled variables).

Variable	η^2
Age	0.223
The number of working days per week	0.048
The number of everyday working hours per day	0.031
The number of hours between breaks	0.018
Knowledge of COVID-19	0.116

Binary logistic regression

A binary logistic regression model was then developed to see the relations between the predictor variables and outcome variable (the anxiety state of DHCP). The Chi-square for this model was 50.612 ($p < 0.001$), suggesting that the model fitted the data well. The overall classification accuracy rate of the model was 83.6%. Specifically, 98.2% of the DHCP without anxiety disorders were accurately classified, but the accuracy rate of classification was lower (30%) for those with anxiety disorders. The coefficients of all predictor variables were presented in Table 5. These four predictive variables were significantly related to the anxiety state of DHCP and predictive to the outcome variable. With the increase of age and the knowledge of COVID-19, there was a decreasing likelihood of DHCP to suffer from anxiety disorders. Similarly, adopting PM-3 at dental settings would predict the reduction of DHCP with anxiety disorders. On the contrary, the conflicts between colleagues and patients would increase the odds of DHCP to have anxiety disorders. More specifically, based on the odds ratio, the odds of DHCP who had conflicts with

patients or colleagues to get anxiety disorder were 2.842 times higher than groups who did not. The odds of DHCP with PM-3 to get anxiety was 0.249 times lower than that of DHCP who did not have PM-3. As for age and knowledge of COVID-19, one unit of increase in these variables would change the likelihood of DHCP suffering from anxiety disorders by a factor of 0.890 and 0.744 respectively.

Table 5
Results of binary logistic regression analysis.

Variable	Coefficient	OR (95%IC)	P-value
Age	-0.116	0.890(0.827–0.958)	0.002
PM-3 ^a	-1.388	0.249(0.106–0.587)	0.001
Conflicts with colleagues and/or patients ^b	1.045	2.842(1.176–6.868)	0.020
Knowledge of COVID-19	-0.295	0.744(0.561–0.987)	0.040
Constant	1.877	26.177	0.001
^a Does your workplace follow PM-3?			
^b Did you have conflicts with colleagues and/or patients in the last six months?			

Discussion

The comparison between the anxiety state of DHCP and that of the general public indicated that DHCP were more susceptible to anxiety disorders than the general public were while COVID-19 pandemic persists, which was similar to the study on HCWs during the outbreak of COVID-19.^{2,3} Different from previous studies,¹¹ our data suggested that workload did not strongly influence the anxiety state of DHCP after dental settings reopened. Although performing aerosol procedures was perceived to be risky,^{16,17} it was not a significant factor for anxiety of DHCP. Similarly, despite the blood, saliva, respiratory droplets of COVID-19 carriers are infectious,^{18,19} the exposure of skin and wounds to them was not significantly related to the anxiety state of DHCP. But being in contact with suspected or confirmed cases slightly arose concerns among DHCP.

Compared to these factors, PM-3, communications and social relationships with colleagues and patients, and the knowledge of COVID-19 showed significant impact on the anxiety state of DHCP. Despite the discomfort brought by personal protective equipment, this helped to ease the anxiety of DHCP. In alignment with previous study, less conflicts and good communications with patients and colleagues also help them experience less anxiety.¹⁰ Different from the study with the general public,⁶ a better understanding of COVID-19 facilitated DHCP to feel less anxious in the present situation. In addition, older DHCP were less likely to experience anxiety than younger ones, which was also observed among the public in the outbreak of COVID-19.⁶

Some practical suggestions could be made according to this study. In addition to implementing triage and appropriate protective measures, psychological support for DHCP were needed. For department and clinic managers, cultivating a good atmosphere could ease the anxiety experienced by their colleagues. Timely interventions and communications could be helpful to resolve conflicts occurred between DHCP and patients, or between colleagues. Compared to older DHCP, younger ones require more psychological support since they generally have less clinical and social experiences than their senior colleagues. Sufficient training and useful information of COVID-19, along with regular counseling services provided by dental institutions or hospitals were demanded. Although PM-3 were considered with inconvenience, it is important to the mental and physical health of DHCP. Practical strategy could be adopted to improve the feeling of wearing PPE, but protocols need to be strictly followed. Last but not least, providing mental treatments could help DHCP to maintain healthy mental state.

There were several limitations indicated. First, the sample came from voluntary internet users, therefore the selection bias could exist. Secondly, the mental status of the same group of DHCP before the COVID-19 outbreak cannot be compared because of the sudden appearance of the disease. Last, various other factors, such as personality,²⁰ could contribute to the occurrence of anxiety disorders in DHCP but a limited number of factors were examined in this study owing to the limited sample size.

Conclusions

During the COVID-19 pandemic, DHCP were more likely to suffer from anxiety disorders than the general public after returning to work at dental settings. The anxiety state of them was influenced by their age, the implementation of PM-3, conflicts with colleagues and patients, and the knowledge of COVID-19. More specifically, younger DHCP were more likely to suffer from anxiety disorders than older ones. DHCP with PM-3 were less likely to experience anxiety disorders than those without. Conflicts with colleagues and patients had adverse impact on the anxiety state of them. More knowledge of COVID-19 assisted DHCP to stay less anxious.

Abbreviations

COVID-19: Coronavirus Disease 2019

DHCP: Dental Healthcare Personnel

HCWs: Healthcare workers

PM-3: Level three protective measures

PPE: Personal Protective Equipment

Declarations

Ethics approval and consent to participate

This study was reviewed and approved by the Ethics Committee of First People's Hospital of Yichang.

Consent for publication

Written consent was obtained from each participant who answered the questionnaire. The consent form, approved by the Ethics Committee of First People's Hospital of Yichang, was attached to the questionnaire upon distribution.

Availability of data and materials

The data that support the findings of this study are available on request from the corresponding authors, LZ, BL, and RS. The data are not publicly available due to privacy restrictions.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SZ conceived and designed the structure of this paper; SZ and BL wrote the paper; JC designed the questionnaire and collected and sorted out the data. LZ and BL counted the results and reviewed the paper. RS reviewed the paper and made modifications in structure, style, and language.

LZ, BL, and RS contributed equally in this article.

All authors read and approved the final manuscript.

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