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Risk factors for anxiety of otolaryngology healthcare workers in Hubei province fighting coronavirus disease 2019 (COVID-19)

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Abstract

Purpose To ensure the mental health of the otolaryngology healthcare workers in the fight against coronavirus disease 2019 (COVID-19), it is important to know their mental status and to identify possible risk factors. In this study, we investigated the risk factors for the anxiety in the otolaryngology healthcare workers in Hubei province under the COVID-19 epidemic.

Methods The otolaryngology healthcare workers in Hubei Province were surveyed using an online questionnaire in which anxiety was measured against the Zung Self-rating Anxiety Scale. Univariate and multivariate logistic regression analyses were used to evaluate the risk factors of anxiety.

Results A total of 449 otolaryngology healthcare workers participated in the study. Of all the participants, 131 (29.18%) had anxiety symptoms. Compared with doctors, nurses were at a higher risk for anxiety (OR = 2.162, 95% CI 1.311–3.566). Participants who often suspected self-infection (OR = 4.239, 95% CI 1.647–10.909) or family member infection by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (OR = 4.485, 95% CI 1.511–13.313) were more likely to develop anxiety than those who never. The subjects who had colleagues diagnosed with COVID-19 were more vulnerable to anxiety (OR = 2.014, 95% CI 1.205–3.366). Respondents working in infectious isolation wards had a 3.522-fold increased risk of anxiety compared to those on leave (OR = 3.522, 95% CI 1.634–7.593).

Conclusion Some otolaryngology healthcare workers in Hubei province experienced anxiety during the epidemic, but most of them did not receive treatment. The healthcare providers themselves should be informed about and aware of their own mental health, and should be given support as appropriate.

Trial registration number and date of registration Chinese Clinical Trial Registry: ChiCTR2000030768, 2020/3/14.

Keywords COVID-19 · SARS-CoV-2 · Anxiety · Otolaryngology healthcare workers · Hubei province

Introduction

At the end of 2019, a pneumonia caused by an unknown pathogen was reported in Wuhan, China. Subsequently, the epidemic hit Hubei Province, China. The pathogen was later identified to be a novel coronavirus, dubbed "severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)" by the World Health Organization, and the SARS-CoV-2-associated disease was designated coronavirus disease 2019 (COVID-19) [1]. The COVID-19 is highly infectious and life-threatening and can transmit from person to person via contact, respiratory droplets and aerosols [2]. People of all ages might fell victim to the lethal disease and so far no effective treatment is available [1, 3]. Chinese governments, central and local, have been actively responding to the epidemic, with great success. The disease control measures adopted involved city lockdown, patient isolation, building of makeshift infectious disease hospitals, nation-wide mobilization of healthcare workers for fighting the disease, development and improvement of new drugs, redeployment of medical resources, among others.

At this special time, healthcare workers worldwide are under added physiological, psychological and social

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pressures, and are much more vulnerable to psychological problems. Anxiety was shown to be one of the most common psychological issue during an epidemic [4, 5]. Persisting anxiety would reduce living and working ability, cause physical illness and impair personal productivity, and finally increase incidence of subsequent depression of healthcare workers [6, 7]. Otolaryngology healthcare workers were one of the most special groups in this anti-epidemic care: upper respiratory diseases were among the most common diseases in otolaryngology settings, and the otolaryngology healthcare workers might treat COVID-19 patients not only in fever clinics and infectious isolation wards, but also in the general hospitals or clinics. In addition, some high-risk operations such as tracheotomy and pharyngeal swabbing during the treatment of COVID-19 patients were all performed by the otolaryngologists.

To win the battle against the epidemic and improve work efficiency, we should know the psychological status of the healthcare workers and address the issue before it takes its toll. This study aimed to determine the prevalence and demographic features of anxiety in otolaryngology healthcare workers of Hubei province, with an attempt to find the association between anxiety and clinical characteristics, and provide information for appropriate interventions.
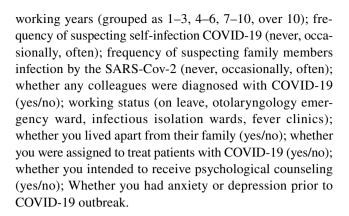
Participants and methods

Participants

The study was approved by the Ethics Committee of Zhongnan Hospital of Wuhan University (2020046), Wuhan, China. The subjects were otolaryngology healthcare workers in Hubei Province and an online questionnaire investigation was conducted from February 24, 2020 to February 28, 2020 (a month after Wuhan was put on lockdown). People who had suffered from anxiety or depression prior to the COVID-19 outbreak were excluded.

Questionnaires

The questionnaire consisted of the Chinese version of Zung Self-rating Anxiety Scale (SAS) and covered all factors potentially associated with anxiety. The SAS contains 20 items and anxiety was rated on a 4-point scale. A standard score was obtained by multiplying a raw score by 1.25 and rounding [8]. For the Chinese subjects, the threshold for assessing the presence of anxiety was a standard score of 50 [9, 10]. And a recent research suggested that the original raw cut-off score of 40 was most appropriate for questionnaire investigation [11]. The rest of the questionnaire, which included working city; occupation (doctor, nurse); age (grouped as less than 25, 26–35, 36–45, 46 and older);

working years (grouped as 1–3, 4–6, 7–10, over 10); frequency of suspecting self-infection COVID-19 (never, occasionally, often); frequency of suspecting family members infection by the SARS-Cov-2 (never, occasionally, often); whether any colleagues were diagnosed with COVID-19 (yes/no); working status (on leave, otolaryngology emergency ward, infectious isolation wards, fever clinics); whether you lived apart from their family (yes/no); whether you were assigned to treat patients with COVID-19 (yes/no); whether you intended to receive psychological counseling (yes/no); Whether you had anxiety or depression prior to COVID-19 outbreak.

Statistical analysis

All analyses were conducted independently by two researchers using statistical software SPSS (version 22.0, SPSS Inc, Chicago, IL, USA). First, Cronbach's alpha for the SAS was calculated. Then, the distribution of variables was analyzed by Kolmogorov–Smirnov test. Normally distributed data were presented as means and standard deviations, non-normally distributed data were expressed as the median and the first and third quartile values, and qualitative variables were described as frequencies and percentages. Finally, a binary Logistic regression model of anxious and non-anxious population was established, and univariate and multivariate Logistic regression analyses were used to identify the factors that might be related to anxiety. A p value < 0.05 was considered to be statistically significant.

Results

General characteristics of subjects

Among 493 consecutively enrolled patients, 44 were excluded, because of incomplete questionnaires, non-otolaryngology healthcare workers, non-Hubei province personnel. Table 1 details the clinical characteristics of 449 participants from 15 prefecture-level cities in Hubei province. Of the 449 participants, 301 (67.04%) were from Wuhan, more than two-thirds (63.47%) were doctors. There existed no obvious differences in the number of participants in each age category, except for fewer people under the age of 25. The work time of most subjects lasted over 10 years (61.25%). Healthcare workers worried about their families being infected by the SARS-Cov-2 were more than those concerned about self-infection. 71.71% of respondents had colleagues diagnosed as having COVID-19. About half (52.78%) of the subjects were working in the otolaryngology emergency ward, nearly a fifth (18.93%) in the infectious isolation ward and 6.24% in the fever clinics. And 16.49% and 23.17% of doctors and nurses worked in isolation

Table 1 Characteristics of study subjects

	N (%)	Standard score	Anxiety	
			No	Yes
Working city				
Other	148 (32.96%)	42.5 (35.63, 48.75)	117 (79.05%)	31 (20.9%)
Wuhan	301 (67.04%)	43.75 (36.25, 53.75)	201 (66.78%)	100 (33.22%)
Occupation				
Doctor	285 (63.47%)	42.5 (35, 50)	213 (74.74%)	72 (25.26%)
Nurse	164 (36.53%)	50 (37.5, 56.25)	105 (64.02%)	59 (35.98%)
Age				
Less than 25	19 (4.23%)	41.25 (36.25, 62.5)	12 (63.16%)	7 (36.84%)
26–35	164 (36.53%)	43.75 (36.25, 52.5)	113 (68.90%)	51 (31.10%)
36–45	131 (29.18%)	43.75 (35, 51.25)	91 (69.47%)	40 (30.53%)
46 and older	135 (30.07%)	41.25 (35.63, 48.75)	102 (75.56%)	33 (24.44%)
Working years				
1–3	49 (10.91%)	40 (33.75, 50)	36 (73.47%)	13 (26.53%)
4–6	49 (10.91%)	45 (36.25, 55)	29 (59.18%)	20 (40.82%)
7–10	76 (16.93%)	45.63 (38.75, 52.5)	54 (71.05%)	22 (28.95%)
Over 10	275 (61.25%)	42.5 (35, 51.25)	199 (72.36%)	76 (27.64%)
Frequency of suspected self-infection COVID-19				
Never	111 (24.72%)	38.75 (31.88, 43.75)	98 (88.29%)	13 (11.71%)
Occasionally	283 (63.03%)	43.75 (36.25, 51.25)	202 (71.38%)	81 (28.62%)
Often	55 (12.25%)	55 (46.88, 63.13)	18 (32.73%)	37 (67.27%)
Frequency of suspected family members infection by the SARS-Cov-2				
Never	48 (10.69%)	40 (36.25, 43.75)	43 (89.58%)	5 (10.42%)
Occasionally	198 (44.1%)	38.75 (33.75, 47.5)	163 (82.32%)	35 (17.68%)
Often	203 (45.21%)	47.5 (41.25, 56.25)	112 (55.17%)	91 (44.83%)
Whether any colleagues diagnosed COVID-19				
No	322 (71.71%)	41.25 (35, 48.75)	248 (77.02%)	74 (22.98%)
Yes	127 (28.29%)	47.5 (40.63, 57.5)	70 (55.12%)	57 (44.88%)
Working status				
On leave	99 (22.05%)	41.25 (33.75, 46.25)	84 (84.85%)	15 (15.15%)
Otolaryngology emergency ward	237 (52.78%)	42.5 (36.25, 51.25)	167 (70.46%)	70 (29.54%)
Infectious isolation ward	85 (18.93%)	47.5 (40, 58.75)	45 (52.94%)	40 (47.06%)
Fever clinics	28 (6.24%)	43.75 (38.75, 48.75)	22 (78.57%)	6 (21.43%)
Whether you lived apart or separately from their family				
No	281 (62.58%)	42.5 (35, 48.75)	216 (76.87%)	65 (23.13%)
Yes	168 (37.42%)	46.25 (38.13, 55)	102 (60.71%)	66 (39.29%)
Whether to treat patients with COVID-19				
No	240 (53.45%)	41.25 (35, 47.5)	192 (80.00%)	48 (20.00%)
Yes	209 (46.55%)	46.25 (37.5, 56.25)	126 (60.29%)	83 (39.71%)

wards, respectively. More than a half of the participants (62.58%) lived apart from their family members to avoid cross-infection. About half (53.45%) of the participants had treated patients with COVID-19. Only nine participants had received psychological counseling.

Prevalence of anxiety

The internal consistency of SAS was high, with Cronbach's alpha being 0.9. Among the 449 participants, standard score was 43.75 (36.25, 51.25), and 131 (29.18%) had anxiety symptoms. Table 1 shows the numbers of subjects with anxiety in different groups.

Factors associated with anxiety

When all ten independent variables were inputted into a univariate model, and the goodness of fit of the model was high: $\chi^2(8) = 6.782$, $p = 0.56$. Univariate logistic regressions models showed that occupation, working status, frequency

of suspecting self-infection, frequency of suspecting family members, colleagues being diagnosed with COVID-19 were significantly associated with the development of anxiety, whereas the factors such as city of workplace, age, working years, living alone, involvement in the treatment COVID-19 bore no statistically significant relation to the occurrence of anxiety (Table 2). Multivariate logistic regression analysis was used to determine the extent to which anxiety caused by significant factors identified in the aforementioned univariate analysis (Table 2). The model containing the above significant factors had higher goodness of fit: $\chi^2(8) = 7.482$, $p = 0.381$. All these factors also showed significance in multivariate analysis. Compared with doctors, nurses had a higher risk for anxiety (OR = 2.162, 95% CI 1.311–3.566).

Table 2 Binary logistic regression analysis of anxiety associated with risk factors in otolaryngological staff of Hubei Province under the prevalence of COVID-19

	Univariate logistic regression		multivariate logistic regression	
	OR (95% CI)	p value	OR (95% CI)	p value
Working city				
Other	REF	–	–	–
Wuhan	1.211 (0.7–2.095)	0.493	–	–
Occupation				
Doctor	REF	–	REF	–
Nurse	2.486 (1.421–4.349)	0.001**	2.162 (1.311–3.566)	0.003**
Age				
Less than 25	REF	–	–	–
26–35	1.07 (0.253–4.525)	0.927	–	–
36–45	1.242 (0.222–6.934)	0.805	–	–
46 and older	1.443 (0.248–8.417)	0.683	–	–
Working years				
1–3	REF	–	–	–
4–6	1.965 (0.619–6.237)	0.251	–	–
7–10	0.763 (0.243–2.398)	0.644	–	–
Over 10	1.253 (0.364–4.314)	0.721	–	–
Frequency of suspected self-infection COVID-19				
Never	REF	–	REF	–
Occasionally	1.518 (0.732–3.148)	0.261	1.504 (0.737–3.068)	0.262
Often	4.655 (1.752–12.372)	0.002**	4.239 (1.647–10.909)	0.003**
Frequency of suspected family members infection by the SARS-Cov-2				
Never	REF	–	REF	–
Occasionally	1.374 (0.461–4.093)	0.568	1.499 (0.503–4.465)	0.467
Often	4.201 (1.413–12.486)	0.010*	4.485 (1.511–13.313)	0.007**
Whether any colleagues diagnosed COVID-19				
No	REF	–	REF	–
Yes	1.889 (1.076–3.317)	0.027*	2.014 (1.205–3.366)	0.008**
Working status				
On leave	REF	–	REF	–
Otolaryngology emergency ward	1.818 (0.884–3.737)	0.104	1.891 (0.937–3.816)	0.075
Infectious isolation ward	2.872 (1.129–7.31)	0.027*	3.522 (1.634–7.593)	0.001**
Fever clinics	1.061 (0.297–3.786)	0.928	1.325 (0.407–4.308)	0.640
Whether you lived apart or separately from their family				
No	REF	–	–	–
Yes	1.111 (0.611–2.019)	0.730	–	–
Whether to treat patients with COVID-19				
No	REF	–	–	–
Yes	1.239 (0.676–2.274)	0.488	–	–

OR odds ratio, *CI* confidence interval, *REF* reference

*$p < 0.05$

**$p < 0.01$

The incidence of anxiety in doctors and nurses was 25.26% and 35.98%, respectively. Participants who often suspected self-infection of COVID-19 (OR = 4.239, 95% CI 1.647–10.909) and family members infection by SARS-Cov-2 (OR = 4.485, 95% CI 1.511–13.313) were more likely to have anxiety than those who never. The subjects who had colleagues diagnosed with COVID-19 were more vulnerable to anxiety (OR = 2.014, 95% CI 1.205–3.366). Responders working in infectious isolation wards had a risk for anxiety 3.522-fold higher than those on leave (OR = 3.522, 95% CI 1.634–7.593).

Discussion

During the early stage of COVID-19 epidemics, 15.7% of cases developed severe pneumonia, and 8.9% of them died. Initially reported mortality was higher than the current rate, and the discrepancy might be ascribed to the fact that the asymptomatic SARS-CoV-2 virus-carriers were not included at the beginning. Of all the COVID-19 patients, 2.09% were healthcare workers [12]. The staggering mortality rate reported initially put high mental pressure on the healthcare workers. Because of shortage of both human and material resources at the early stage of COVID-19 epidemics, doctors and nurses of none-infectious disease departments were mandatorily deployed to infectious disease departments after short-term training. Unfamiliar work mode, overload work burden, lack of knowledge about the new virus, a country on edge all contributed to the anxiety of otolaryngology healthcare workers. Our multivariate Logistic regression analysis showed that the otolaryngology healthcare workers working at the isolation ward of COVID-19 were more susceptible to anxiety than their counterparts working at otolaryngology emergency wards or at otolaryngology outpatient settings, and the nurses were more vulnerable to anxiety than doctors because nurses were more likely to work in the isolation wards. Tracheal intubation, tracheal suction, blood drawing, infusion of fluid at isolation wards might incur contamination more easily by secretions and droplets. Besides, nurses were more frequently overloaded than doctors in isolation wards of COVID-19.

It was natural during the outbreak of an epidemic such as MERS, that people are worried about being infected. 80% of the population were fearful of being infected and the anxiety persisted for 6 months during MERS outbreak [13]. Peritraumatic distress of COVID-19 among public was at 30% and 35%, respectively, among Italians and Chinese, and the mean scores were very similar in these two populations [14]. In this questionnaire-based study, we found that 29.18% of the otolaryngology workers treating COVID-19 suffered from anxiety. Except for exposure to SARS-CoV-2 virus in isolation wards of COVID-19, we found that the incidence of anxiety in otolaryngology workers who worried about SARS-Cov-2 infection of themselves or family members was 4.24 and 4.49 times higher, respectively, than those who never. The otolaryngology health workers who had colleagues diagnosed with COVID-19 were also more vulnerable to anxiety. Chinese family members, including husbands, wives, children, fathers and mothers, are very closely connected emotionally. In Chinese culture, people take it their responsibilities to make sure their family members are safe. The otolaryngology healthcare workers in our series, without exception, worried about both themselves and their family members. For the safety of family members, the healthcare workers chose to stay in hotels provided by their employers.

Since possible exposure to COVID-19 environments is a risk factor of anxiety of otolaryngology healthcare workers, proper protection is of great importance. Since otolaryngologists are more likely to be very close to patient's upper airway and to secretions, they might be exposed to pathogens during physical examination and other operations. Therefore, the doctors and the nurses working in isolation wards of COVID-19 were more vulnerable to anxiety ($p < 0.05$). Our results indicated that the healthcare workers need to better informed about the COVID-19 epidemics. A case–control study about SARS in 2003 showed that eye protection, wearing N95 face mask and hand hygiene were protection factors for SARS infection in healthcare workers, whereas long work time, contact with patients' secretions and involvement in the emergency treatment were risk factors [15]. The transmission routes and clinical phenotype of COVID-19 mimic SARS, on the basis of our experience with the SARS outbreak in 2003. Alexander et al. proposed that the otolaryngologists have the responsibilities to perform a minimal level of precaution and protection to avoid transmission of virus between patients and doctors [16]. They suggested wearing N95 face mask during worktime and emphasized the importance of hand washing, but full garb including gloves, mask, gown and face protection was not necessary [16]. Therefore, proper protection is very important to avoid anxiety in the otolaryngology workers.

Incidence of depression and anxiety was higher in the healthcare workers than in general populations. About 20–30% of the American hospital workers suffered from pressure or anxiety [17]. The situation was even worse among Chinese hospital workers. In this questionnaire-based study, we found that 29.18% of the otolaryngology workers directly involved in the treatment of COVID-19 had anxiety. Even though the incidence of anxiety in this study was comparable to previously reported results [13, 14, 18], the otolaryngology nurses had higher incidence of anxiety than doctors during the COVID-19 outbreak. Presumably, the mental status of healthcare workers was worse during an epidemic, such as Ebola outbreak in 2014

[19]. The hospital workers with depression or anxiety had increased the adverse safety outcomes by 63% [17], such as occupational exposures, medical errors or other work-related accidents. For safety of both hospital workers and patients, some studies suggested that psychological assistants (therapists) are needed [20]. Even though 29.18% of the otolaryngology workers had various degrees of anxiety, only 1.83% of them had consulted psychologists or sought medical attention. This situation might be attributed to the fact that psychological counseling was not universally accepted in China or the healthcare workers were too busy to care about their mental status. Psychology assistants are especially needed by the otolaryngology healthcare workers in China. The employers of the medical institutions should pay more attention to the mental health of the healthcare worker in their routine work, in general, and during the outbreak of an epidemic, such as COVID-19, in particular.

This study had some limitations. First, it focused on the otolaryngology healthcare workers, without comparing them with other healthcare workers working in other departments, especially those in the departments of respiratory disease, critical care, anesthesiology and infectious diseases. In addition, it was a cross-sectional study, which might hinder the interpretation of causal relationships. Finally, our study only used screening tools, and anxious people still need to be evaluated more accurately by psychologists.

Conclusion

In conclusion, this study showed that (1) the nurses of otolaryngology settings were more vulnerable to anxiety than doctors; (2) worrying about SARS-Cov-2 infection and working in isolation wards were risk factors for anxiety and the otolaryngology healthcare workers need more training about COVID-19; (3) few otolaryngology workers suffering from anxiety sought psychological counseling.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

Ethics approval All procedures performed in studies involving human participants were in accordance with the Ethics Committee of Zhongnan Hospital of Wuhan University and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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