

# Prevalence of depression and its impact on quality of life in frontline otorhinolaryngology nurses during the COVID-19 pandemic in China

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**Objective:** Exposure to the coronavirus disease 2019 (COVID-19) was associated with high risk of mental health problems among frontline nurses. This study examined the prevalence of depressive symptoms (depression hereafter) and its impact on quality of life (QOL) in otorhinolaryngology (ENT) nurses during the COVID-19 pandemic in China. **Methods:** An online study was conducted between March 15 and March 20, 2020. Depression and QOL were assessed using standardized instruments. **Results:** A total of 1,757 participants were recruited. The prevalence of depression was 33.75% (95% CI: 31.59%-35.97%). Results emerging from multiple logistic regression analysis showed that direct care of COVID-19 patients (OR: 1.440, 95% CI: 1.031-2.012,  $P=0.032$ ), and current smoking (OR: 3.143, 95% CI: 1.020-9.690,  $P=0.046$ ) were significantly associated with depression. After controlling for covariates, ENT nurses with depression had a lower overall QOL compared to those without depression ( $F_{(1, 1757)}=536.80, P<0.001$ ). **Conclusions:** Depression was common among ENT nurses during the COVID-19 pandemic in China. Considering the negative impact of depression on QOL and care quality, regular screening for depression should be conducted in ENT nurses and treatment should be provided.

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6 **frontline otorhinolaryngology nurses during the COVID-19**  
7 **pandemic in China**

8 Running head: Depression during COVID-19 pandemic

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40

41 **Abstract**

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45 hereafter) and its impact on quality of life (QOL) in otorhinolaryngology (ENT)  
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51 multiple logistic regression analysis showed that direct care of COVID-19  
52 patients (OR: 1.440, 95% CI: 1.031–2.012,  $P= 0.032$ ), and current smoking  
53 (OR: 3.143, 95% CI: 1.020–9.690,  $P = 0.046$ ) were significantly associated  
54 with depression. After controlling for covariates, ENT nurses with depression  
55 had a lower overall QOL compared to those without depression ( $F_{(1, 1757)}$   
56  $=536.80$ ,  $P<0.001$ ).

57 **Conclusions:** Depression was common among ENT nurses during the COVID-  
58 19 pandemic in China. Considering the negative impact of depression on QOL  
59 and care quality, regular screening for depression should be conducted in ENT  
60 nurses and treatment should be provided.

61 **Keywords:** COVID-19, depression, otorhinolaryngology, quality of life, nurse

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## 65 **Introduction**

66 The novel coronavirus disease (COVID-19) was first reported in Wuhan, China  
67 at the end of 2019. Since then the disease has been reported in more than  
68 200 countries and territories, and COVID-19 has been declared a global public  
69 health emergency (World Health Organization, 2020). The reproduction  
70 number of COVID-19 ranges from 2.24 (95%CI: 1.96–2.55) to 3.58 (95%CI:  
71 2.89–4.39) (Zhao et al., 2020). Similar to other respiratory viruses, this virus  
72 is spread mainly by respiratory droplets of infected cases when people speak,  
73 cough, or sneeze. In early phase of the COVID-19 outbreak, it was presumed  
74 that nosocomial transmission contributed to 41.3% of the infected patients in  
75 the general population and 29% of infected health care workers (Wang et al.,  
76 2020). By the nature of the clinical specialty, healthcare workers in  
77 otorhinolaryngology (ENT) units have a much higher likelihood to have direct  
78 contacts with COVID-19 patients compared with their counterparts in other  
79 clinical specialties. ENT nurses are exceptionally susceptible to aerosolized  
80 viral particles and high viral loads in the upper respiratory tract. This possibly  
81 explained why many health professionals working in ENT units were infected  
82 in the early stage of the COVID-19 outbreak (Lu et al., 2020). For example, in  
83 the UK an ENT consultant was the first frontline clinician who died on 30 March  
84 2020 in combating COVID-19 (NHS, 2020). Due to heavy clinical workload  
85 and high risk of infection, ENT nurses are more likely to suffer from  
86 psychological distress, which could increase the risk of more serious mental  
87 health problems, such as depression (Venugopal et al., 2020; Xu et al., 2020).

88 Depression is associated with a range of negative health outcomes, such  
89 as increased risk of suicide, poor care quality and impaired occupational  
90 functions (Gao et al., 2019; Knight et al., 2018; Woo et al., 2016). In order  
91 to reduce the risk of depression and develop appropriate preventive measures,  
92 it is important to understand its epidemiology. Quality of life (QOL) has been  
93 a widely used comprehensive health outcome in the past decades. To the best

94 of our knowledge, there have been no studies examining the epidemiology of  
95 depression and its impact on QOL in ENT healthcare workers. Therefore, this  
96 study set out to examine the prevalence of depressive symptoms (depression  
97 hereafter) and their impact on QOL in frontline ENT nurses in China during the  
98 COVID-19 pandemic.

99

## 100 **Materials & Methods**

### 101 ***Setting and sample***

102 This was a cross-sectional, anonymous online survey initiated by the  
103 Otolaryngology Branch, Chinese Nursing Association between March 15 and  
104 March 20, 2020 in China. Due to logistic reasons and the high risk of cross-  
105 infection, random sampling and face-to-face interviews were prohibited in  
106 almost all surveys involving frontline health professionals during the COVID-  
107 19 outbreak in China. Similar to other studies (Lai et al., 2020; Zhang et al.,  
108 2020), snowball sampling was used. The survey was conducted using the  
109 WeChat-based Questionnaire Star program. WeChat is a social communication  
110 application with over 1 billion users in China including all participants in this  
111 study. The Questionnaire Star program that has been widely used in many  
112 epidemiological surveys (Li, 2016; Liang and Fan, 2020; Xi, 2017) was  
113 employed in this study. To be eligible, participants needed to be: 1) aged 18  
114 years or above; 2) frontline nurses working in ENT units during the COVID-19  
115 outbreak; 3) able to understand the assessment and provide written informed  
116 consent. The research protocol was approved by the Institutional Review  
117 Board of Beijing Anding Hospital (2020(10)) and all participating hospitals and  
118 universities. All the study procedures were carried out in accordance with  
119 relevant guidelines. All participants provided informed consent to participate  
120 in the study.

121

### 122 ***Instruments***

123 Basic socio-demographic and clinical variables, such as gender, age, marital  
124 status, education level, years of work experience, living circumstances, rank  
125 (junior or senior), hospital setting (primary/secondary vs tertiary hospitals),  
126 shift duty requirement, type of the unit (inpatient or outpatient), smoking  
127 status, and personal experience with the Severe Acute Respiratory Syndrome  
128 (SARS) outbreak on 2003 were collected. Three additional standardized  
129 questions with dichotomous response (yes/no) were also asked: 1) whether  
130 the participant was directly engaged in clinical services for COVID-19 patients;  
131 2) whether they had friends, colleagues, or family members infected with  
132 COVID-19; and 3) the number of COVID-19 confirmed cases in the province  
133 where they lived.

134 The self-report Chinese version of the Patient Health Questionnaire-9  
135 (PHQ-9) was used to measure the severity of depression in the past week.  
136 The PHQ-9 was validated in Chinese populations with a sensitivity of 0.89  
137 and a specificity of 0.77 (Chen, 2015). Each item was scored from 0 to 3, with  
138 the total score of  $\geq 5$  indicating "depression" (Wittkamp et al., 2007). The  
139 total score of "5-9", "10-14", "15-19", and "20-27" indicated "mild  
140 depression", "moderate depression", "moderate-to-severe depression", and  
141 "severe depression", respectively (Wittkamp et al., 2007).

142 Following the example of previous studies (An et al., 2020; Ma et al.,  
143 2020; Wang et al., 2006) QOL was estimated with the first two items on  
144 overall QOL of the validated World Health Organization Quality of Life  
145 Instrument-Brief Version (WHOQOL-BREF) (Skevington et al., 2004). Higher  
146 total scores indicated better QOL. The Chinese version of the WHOQOL-BREF  
147 has been validated in Chinese populations (Xia et al., 2012).

148

### 149 ***Data analysis***

150 Data were analyzed with the IBM Statistical Package for Social Science  
151 (SPSS), software version 24.0. Normality of the data was assessed using

152 the Kolmogorov-Smirnov test. Comparison between the 'depression' and 'no  
153 depression' groups in terms of demographic and clinical characteristics were  
154 conducted by chi-square test, two samples independent sample *t*-test and  
155 Mann-Whitney U test, as appropriate. QOL was compared between the two  
156 groups using analysis of covariance (ANCOVA) after controlling the potentially  
157 confounding effects of variables with significant group difference in univariate  
158 analyses. The independent demographic and clinical correlates of depression  
159 were examined using multiple logistic regression analysis with the "Enter"  
160 method with depression as the dependent variable. All variables with a *P*-value  
161 of less than 0.1 in univariate analyses were entered as independent variables.  
162 A *P*-value of less than 0.05 was considered statistically significant (two-tailed).

163

## 164 **Results**

165 A total of 1,757 frontline ENT nurses (females  $n=1,746$ , 99.4% of the sample)  
166 participated in the study. The overall prevalence of depression was 33.75%  
167 (95% CI: 31.59%-35.97%). Among the healthcare workers with probable  
168 depression ( $N=593$ ), 421 (24.0%) reported mild, 116 (6.6%) moderate, 42  
169 (2.4%) moderate-to-severe, and 14 (0.8%) severe depression. The mean  
170 total score of the PHQ-9 scale was 3.73 ( $\pm 4.43$ ) in the whole sample.

171 Table 1 shows the demographic and clinical characteristics of the whole  
172 sample separated by depression. Univariate analyses revealed that direct care  
173 with confirmed COVID patients ( $P=0.025$ ), current smoking ( $P=0.033$ ), and  
174 years of work experience ( $P=0.020$ ) were significantly associated with  
175 depression. After controlling for covariates including looking after infected  
176 patients, smoking, work experience, depressed nurses were more likely to  
177 have overall lower QOL than those without depression ( $F_{(1, 1757)}=527.94$ ,  
178  $P<0.001$ ). Five variables with a *P*-value of  $< 0.1$  were entered in multiple  
179 logistic regression analysis as independent variables including working in  
180 tertiary hospitals, nursinginfected patients, smoking, age, and work

181 experience. Direct care of COVID-19 patients (OR=1.441,  $P=0.032$ ) and  
182 smoking (OR=2.880,  $P=0.048$ ) were independently associated with higher  
183 risk of depression (Table 2).

184

## 185 **Discussion**

186 To the best of our knowledge, this was the first study that examined the  
187 prevalence, demographic and clinical factors associated with depression in  
188 ENT nurses during the COVID-19 pandemic. Other studies have examined the  
189 epidemiology of depression in health professionals in China. In the early stage  
190 of the COVID-19 outbreak at the end of January 2020, 50.4% of frontline  
191 medical professionals working in Wuhan and the surrounding areas of Hubei  
192 province reported depression measured using the PHQ-9 with a cut-off value  
193 of 5 (Lai et al., 2020). With the same cut off value in the PHQ-9, the  
194 prevalence of depression in healthcare workers in Wuhan was 36.9% between  
195 January 29 and February 4, 2020 (Kang et al., 2020). In contrast, the  
196 prevalence of depression in frontline healthcare workers was 12.2% assessed  
197 with the PHQ-4 with a lower cut-off value of 3 from February 19 to March 6,  
198 2020 (Zhang et al., 2020). Findings of the current study (33.75%; 95% CI:  
199 31.59%-35.97%) were similar to those of some (Kang et al., 2020), but not  
200 all studies (Lai et al., 2020; Zhang et al., 2020). Due to the use of different  
201 measurement tools on depression, direct comparison between these studies  
202 should be interpreted with caution.

203 In ENT units, asymptomatic and pre-symptomatic patients with COVID-  
204 19 may seek help for anosmia, which is a common symptom of COVID-19  
205 (Hopkins et al., 2020). Examinations of the nasal passages and upper airway,  
206 intubation and administration of respiratory treatment can induce cough,  
207 nausea, sneezing or vomiting (Lu et al., 2020). The nasal pillow masks for  
208 patients with obstructive sleep-apnea may allow airborne virus transmission  
209 due to loose sealing (Tran et al., 2012). In the 2003 SARS outbreak, clusters

210 of nosocomial infections were observed among healthcare workers during  
211 airway manipulation (JAMA, 2003). All these factors could increase the  
212 likelihood of COVID-19 infection for ENT nurses, leading to common mental  
213 health problems, such as depression.

214       Similar to previous findings (Lai et al., 2020; Pan et al., 2020), frontline  
215 ENT nurses who provided direct care for COVID-19 patients were more likely  
216 to have depression. During the COVID-19 outbreak, ENT nurses had to do  
217 shift duty and worked longer hours than usual, which can lead to high level of  
218 stress. All health professionals were confined to at least two weeks quarantine  
219 after they finished care to COVID-19 patients, which can increase their anxiety  
220 and induce guilt feelings due to the social stigma affecting their families, as it  
221 happened during the SARS epidemic (Holmes et al., 2020; Li et al., 2020;  
222 Nickell et al., 2004; Yip et al., 2010). All these factors could substantially  
223 increase the risk of depression. Smoking is associated with higher risk of  
224 medical conditions and psychiatric disturbances including depression (Chang  
225 et al., 2020; Fluharty et al., 2017; Mathew et al., 2017). This study also found  
226 that depressed ENT healthcare workers were more likely to smoke (Nilan et  
227 al., 2019; Schneider et al., 2019)

228       According to the distress/protection model of QOL (Voruganti et al.,  
229 1998), QOL is the result of the interaction between protective (e.g., high self-  
230 esteem and good social support) and distressing factors (e.g., physical and  
231 psychological stress). Consistent with previous findings (Benedek et al., 2007;  
232 Mammen and Faulkner, 2013; Roche et al., 2020) depressed ENT nurses had  
233 a poorer QOL compared to the those without depression in this survey . This  
234 could be explained by the negative health outcomes of depression, such as  
235 impaired psychosocial functioning and somatic symptoms of fatigue, loss of  
236 appetite or weight, and insomnia (Anosike et al., 2020; Malhi and Mann, 2018;  
237 Parisi et al., 2014; Rakofsky et al., 2013).

238 The strengths of this study include the large sample size and the use of  
239 standardized instruments. However, several limitations should be addressed.  
240 First, because of the cross-sectional design, the causality between the  
241 demographic and clinical variables and depression could not be established.  
242 Second, data were collected by online self-report, therefore the the validity of  
243 certain variables (e.g., history of psychiatric disorders) could not be tested  
244 and recall bias could exist, which is a common limitation in all online surveys.  
245 Third, due to logistical reasons, relevant factors related to depression in ENT  
246 nurses, such as lifestyle, family support, work load including the number of  
247 daily outpatient visits and inpatients in participating hospitals, were not  
248 obtained. Forth, due to the lack of rating scales on COVID-19-related  
249 experiences in China, participants were asked only using three standardized  
250 questions with dichotomous response, similar to previous studies (Forte et al.,  
251 2020; Zhong et al., 2020). Fifth, the snowball sampling method was used,  
252 thus the number of ENT nurses who did not complete the assessment or  
253 refused to participate in the study could not be recorded. Finally, this is an  
254 anonymous survey, therefore, participants' hospital and personal identifying  
255 information was not collected. Sixth, the exclusion of participants with pre-  
256 existing mental health problems could have biased the results to an uncertain  
257 extent.

258

## 259 **Conclusions**

260 Depression was common among ENT nurses during the COVID-19 pandemic  
261 in China. Considering the negative impact of depression on their QOL and the  
262 quality of care ENT nurses provide, regular screening for depression should be  
263 conducted for this particularly vulnerable cohort of health workers coupled  
264 with easily available treatment .

265

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268

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**Table 1** (on next page)

Table 1 Demographic characteristics of the study cohort of ENT nurses

1 **Table 1** Demographic characteristics of the study cohort of ENT nurses

2

Variables	Total (N=1,757)		No depression (N=1,164)		Depression (N=593)		X <sup>2</sup>	df	P
	N	%	N	%	N	%			
Married	1310	74.6	875	75.2	435	73.4	0.683	1	0.409
College education and above	1707	97.2	1131	97.2	576	97.1	0.001	1	0.970
Living with family	1483	84.4	988	84.9	495	83.5	0.590	1	0.442
Junior rank	1017	57.9	683	58.7	334	56.3	0.892	1	0.345
Experience with SARS	204	11.6	136	11.7	68	11.5	0.018	1	0.893
Working in tertiary hospitals	1528	87.0	1001	86.0	527	88.9	2.862	1	0.091
Working in inpatient department	1535	87.4	1024	88.0	511	86.2	1.154	1	0.283
Shift duty	1195	68.0	789	67.8	406	68.5	0.084	1	0.772
Local COVID-19 cases ≥ 500	235	13.4	161	13.8	74	12.5	0.620	1	0.431
Having infected family/friends/colleagues	86	4.9	50	4.3	36	6.1	2.660	1	0.103
Looking after infected patients	158	9.0	92	7.9	66	11.1	4.996	1	<b>0.025</b>
Current smoker	13	0.7	5	0.4	8	1.3	4.523	1	<b>0.033</b>
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>T/Z</b>	<b>df</b>	<b>P</b>
Age (years)	34.09	8.03	33.86	8.23	34.56	7.62	-1.729	175 5	0.084
Work experience (years)	12.72	8.82	12.51	9.01	13.12	8.42	-2.324	---	† <b>0.020</b>
Total QOL score	6.64	1.57	7.18	1.36	5.58	1.40	23.064	175 5	<b>&lt;0.001</b>

Note: due to the very small sample size of male nurses in this sample (N=11), gender was not included in analyses.

†: Mann-Whitney U test; Bolded values: P<0.05; M: mean; SD: standard deviation; COVID-19: Corona Virus Disease 2019; SARS: Severe Acute Respiratory Syndrome; QOL: Quality of Life



**Table 2** (on next page)

Table 2 Independent correlates of depression by multiple logistic regression analysis

1 **Table 2** Independent correlates of depression by multiple logistic regression analysis

Variables	Multiple logistic regression analysis		
	OR	95% CI	<i>P</i> value
Working in tertiary hospitals	1.295	0.953-1.761	0.098
Looking after infected patients	1.441	1.031-2.013	<b>0.032</b>
Current smoker	2.880	1.018-8.979	<b>0.048</b>
Age (years)	1.028	0.984-1.074	0.216
Work experience (years)	0.984	0.945-1.024	0.423

Note: No collinearity between independent variables was found.

Bolded values:  $P < 0.05$ ; CI: confidential interval; OR: odds ratio; QOL: Quality of Life

2