


BMJ Open Depression and anxiety symptoms to COVID-19 outbreak among the public, medical staff and patients during the initial phase of the pandemic: an online questionnaire survey by a WeChat Mini Program

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ABSTRACT

Objectives To survey anxiety and depression symptoms to COVID-19 outbreak in the public, medical staff and patients during the initial phase of the pandemic.

Design Cross-sectional online survey administered through WeChat Mini Program using Chinese versions of Zung Self-rating Depression Scale and Zung Self-rating Anxiety Scale.

Setting Guangzhou, China.

Participants 47 378 public, 1512 medical staff and 125 patients with COVID-19.

Results Higher rates of depression (47.8%) and anxiety symptoms (48.7%) were shown by patients who were screened positive compared with those of the public (35.6%, 25.7%) or medical staff (15.4%, 13.3%). The professional identity of a nurse, conditions of 'with an infected family member' and 'working at the frontline' were risk factors to depression or anxiety symptoms for the medical staff. Younger age, lower educational level, female and not having adequate masks were the risk factors for the public.

Conclusion The COVID-19 outbreak increased people's depression or anxiety emotion responses, which varied extensively among the patients, public and medical staff.

INTRODUCTION

Although 1 year has passed since the COVID-19 was first diagnosed and reported in the Hubei province of China, it is still pathologically and psychologically affecting people worldwide.¹ SARS-CoV-2 impairs the central nervous system to result in mental disturbances in few patients with COVID-19 by the direct infection or subsequent influences from abnormal immune system functions or severe somatic diseases.^{2 3} The COVID-19 mainly impacted people's mental health as a psychological stressor arouses

Strengths and limitations of this study

- The standardised common scales of Zung Self-rating Depression Scale and Zung Self-rating Anxiety Scale were used to measure the emotional responses.
- A very large sample of the public during the initial phase of the COVID-19 pandemic was enrolled.
- Different emotional responses and affecting factors were analysed among the public, health workers and patients with COVID-19.
- The actual identities of participants were not acquired because of online surveying.

from its infectious and fatal natural features and special control and preventive social measures.^{4 5}

According to the previous studies, anxiety and depression symptoms were most frequent among the patients, public and medical staff during the initial stage of the COVID-19 outbreak.⁶⁻¹² The stress levels vary among the different populations during the pandemic due to different threat intensities. The patients with COVID-19 and frontline medical staff were considered at higher risk for mental disorders than the public. However, only a few studies compared psychological responses to the COVID-19 pandemic among these populations.

This online psychological self-rating survey had been conducted among the public, medical staff and patients from 31 January to 14 February 2020. At that time, the most positive and restrictive measures that were being carried out nationally to prevent the epidemic and the remarkable biological feature of infection of COVID-19 made the

online survey the more optimal way to collect evidence for psychological intervention to the outbreak.

METHODS

Participants

The present online psychological self-rating survey was released at the WeChat official account of the Third Affiliated Hospital of Sun Yat-sen University and readily available to people nationwide who want to do it. The inclusion criteria are as follows: (1) informed consent; (2) male or female; (3) 12 years of age or older; (4) education at or above primary school level. Exclusion criteria include: (1) lack of essential information such as age and gender; (2) incompleteness of psychological scales; (3) selection of more than one edition of the survey. To ensure that they could read and understand the text of the questionnaire or psychological scales and complete it independently, we required participants to have an educational level of the primary school or above and more than 12 years old.

Instruments

A study team comprising psychiatrists and artificial intelligence (AI) engineers from the Third Affiliated Hospital of Sun Yat-sen University designed the psychological self-rating survey program. Three editions and three subsequent access paths were prepared: the public, medical staff and patient edition.

All the three editions comprised five parts, including an informed consent form and instructions for the survey, a questionnaire for demographic data and questions regarding the epidemic, the Chinese version of the Zung Self-rating Anxiety Scale (ZSAS), the Chinese version of the Zung Self-rating Depression Scale (ZSDS), and a survey outcome and relevant self-adjustment recommendations or methods for getting professional help. In the first part of the informed consent, the minor was instructed to get agreement from parents or guidance before he started this survey.

The demographic information involved gender, age, marriage, occupation and location. Also, certain specific survey questions were included in various editions. For instance, related questions in the survey for the public included: 'Do you have enough masks?' and 'Have your family members been infected?'. The survey for medical staff comprised questions such as: 'Have you worked at the isolation ward or fever clinic?', 'Have your family members been infected?' and 'Have you been kept on-call to leave for Hubei province to assist treatment of COVID-19?'. The Chinese versions of ZSDS¹³ and ZSAS¹⁴ were two common standardised scales with good validity and reliability used for assessing the depression and anxiety severities, respectively, during the past 1 week. The scales of ZSDS and ZSAS were commonly used to evaluate depression and anxiety symptoms in clinical work and research since they were introduced to China in the 1980s of the 20th century. Many previous studies had used these two

scales to evaluate the depression or anxiety symptoms in Chinese population including adolescents.^{15–18} Among patients with depression, the correlation coefficient between scores of ZSDS and scores of Hamilton Depression Scale was 0.84.¹³ Among patients with neurosis, the correlation coefficient between scores of ZSAS and scores of Hamilton Anxiety Scale was 0.365.¹⁴ These two scales had the same number of items (20) and similar score calculation methods. The scores were obtained as follows: the crude scale score (CS) was equal to the sum of each item score, and the scale standardised score (SS) or index score was equal to CS multiplied by 1.25. Cut-off scores of the severity of anxiety as per ZSAS SS were set as none: if <50; mild: 50–59; moderate: 60–69; and severe: >70. A cut-off score of screening positive for anxiety symptoms was 50 of the ZSAS SS. Cut-off scores of the severity of depression per ZSDS SS were set as none: if <53; mild: 53–62; moderate: 63–72; and severe: >72. A cut-off score of screening positive for depression symptoms was 53 of the ZSDS SS.¹⁹

Procedure

This self-rating system was designed in the form of a WeChat Mini Program that people could use through the smart mobile phone to read the QR code and authorise a WeChat application to add this mini program, and then select one of the three optimal editions for self-assessment.

Data cleaning

First, all test data using an age marker with the help of one input by the AI engineers were cleaned. Second, except for the last complete data, the rest of the data from the same person in a single day were discarded. Except for the data of the first day, all the duplicates of the data entered by the same person on other days were discarded. Third, data without both the ZSDS and ZSAS scores were deleted. Fourth, data with logical inconsistencies such as the contradiction between choosing the medical staff edition and age of <18 years, among occupation and educational levels and age, selecting all three editions to respond, etc (figure 1).

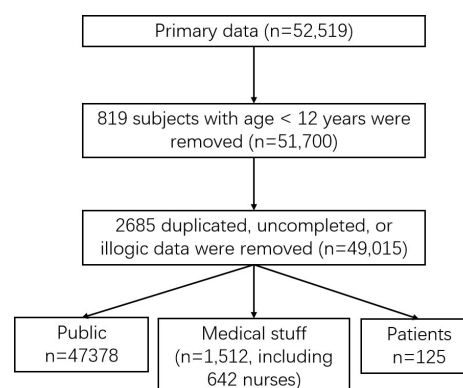


Figure 1 The flow chart of data cleaning.

Statistical analysis

To build the data set and conduct statistical analysis, the IBM SPSS Statistics for Windows V.26.0 (IBM) was used. Comparisons of group ZSDS SS or ZSAS SS were performed by t-test or one-way analysis of variance (ANOVA). Distributions of varying ratios of severity levels were compared between groups through the χ^2 test. The binary variable of screening positive for depression or anxiety symptoms, 0—negative and 1—positive, was the dependent variable. Demographic factors such as gender, age, education, occupation, location, whether any family member is infected, whether working at the isolation ward and whether working at fever clinics were the independent variables. Logistic regression was performed to analyse the relevant factors of depression or anxiety responses to the epidemic. As the natural limitation of the online survey, there were several missing values in the data set. We used a set of measures to handle missing values as follows: first, during the data cleaning, according to the inclusion and exclusion criteria to screening the data of every participant; second, in the processes of analyses of t-test and ANOVA, we chose the option of 'exclude cases analysis by analysis' to avoid the influences of missing values on statistical results; third, the χ^2 test and binary logistic regression were abundant to automatically exclude missing values of involved variables during data processing. We did not use other specific statistical function to handle missing values. The statistical level of significance was set at $\alpha=0.05$.

Patient and public involvement

No patient or the public were involved in the design, conduct, reporting or dissemination plans of the research.

RESULTS

Overall view and demographic data

Data pertaining to 52519 cases gathered from 31 January to 14 February 2020 were exported from the program computer server. The respondents geographically belonged to 34 provinces of China, of which Guangdong (28 068, 53.4%), Henan (1921, 3.7%), Hubei (1643, 3.1%), Hunan (1407, 2.7%), Beijing (1356, 2.6%), Shanghai (1050, 2.0%), Sichuan (986, 1.9%), Guangxi (932, 1.8%), Shandong (916, 1.7%) and Jiangsu (893, 1.7%) were the top 10 provinces. Following data cleaning, data of 49015 cases were pooled for further analysis, comprising 47378 public, 1512 medical staff and 125 patients. Valid data included 29867 cases of ZSDS and 43149 cases of ZSAS. Among 1512 cases of medical staff, 642 reported their occupations as a nurse.

Overall, 32801 people had provided the information on their gender (among the public, 5098 were males (35.8%) and 9126 were females (64.2%); among medical staff, 294 were males (19.7%) and 1202 were females (80.3%); among patients, 35 were males (34.0%) and 68 were females (66.0%).

A total of 15561 people had provided information regarding their age. The average age of the 102 cases belonging to the patient group was 32 ± 11 years (range: 14–70 years). The average age of the 13980 cases belonging to the public group was 32 ± 9 years (range: 13–88 years), and the group was divided into five subgroups according to age: <25 years (21.5%); 25–34 years (44.3%); 35–44 years (24.3%); 45–55 years (7.8%); and >55 years (2.2%). The average age of 1479 cases belonging to the medical staff group was 33 ± 8 years (range: 20–62 years), and the group was divided into four subgroups: 20–29 years (35.6%); 30–39 years (43.7%); 40–49 years (14.7%); and >50 years (3.8%).

Differences among the three groups

The patient group exhibited a screening positive rate of 48.7% for anxiety symptoms, which was remarkably greater than those of both the public (25.7%) and medical staff (13.3%) groups ($p<0.001$). The patient group also showed a higher screening positive rate of 47.8% for depression symptoms higher than that of both the public (35.6%) and medical staff (15.4%) ($p<0.001$). For the severity of anxiety, the patient group revealed the highest sum ratios (25.2%) of both moderate and severe among the three groups, and those of the public and medical staff groups were 8.7% and 3.8%, respectively ($p<0.001$). The sum ratios of moderate and severe depression among the patient, public and medical staff groups were 27.8%, 16.3% and 4.0%, respectively ($p<0.001$). Outcomes of one-way ANOVA of SS and all factor scores of ZSDS and ZSAS suggested that significant differences existed among the three groups. All the scores of the patient group were highest among the three groups, followed by the public group and then the medical staff group (table 1).

Associated factors of ZSDS and ZSAS of the medical staff group

Group differences of means and screening positive rates of ZSAS and ZSDS

One-way ANOVA or t-test outcomes for group differences of ZSAS SS and ZSDS SS means indicated that factors such as age, gender, educational levels, marriage status, medical divisions, doctor or nurse, whether working at isolation wards, whether working at fever clinics and having any family member infected may influence the ZSDS SS or ZSAS SS and screening positive rates for depression and anxiety. People with an infected family member exhibited significantly higher screening positive rates for depression (43.3%) and anxiety (40.5%) than individuals having none in the family members infected (table 2).

Logistic regression of screening negative or positive for depression and anxiety symptoms among medical staff

Result of screening positive for depression or anxiety was considered as the dependent variable: negative was set as 0 and positive as 1. The independent variables included age groups, gender, educational levels,

Table 1 Group differences among patients, public and medical staff of survey results of ZSAS and ZSDS

	Medical staff	Public	Patients	Statistics	P value
ZSAS	n=1502	n=41 534	n=113		
Standard scores*	37.93±9.53	42.53±11.27	48.91±13.09	F=141.201	<0.001
Screening positive, n (%)	200 (13.3)	10 656 (25.7)	55 (48.7)	$\chi^2=149.643$	<0.001
Severity, n (%)				$\chi^2=170.207$	<0.001
None	1302 (86.7)	30878 (74.3)	58 (52.2)		
Mild	143 (9.5)	7037 (16.9)	26 (22.6)		
Moderate	50 (3.3)	2685 (6.5)	22 (19.1)		
Severe	7 (0.5)	934 (2.2)	7 (6.1)		
ZSDS	n=1269	n=28 508	n=90		
Standard scores*	39.22±11.84	47.69±14.39	53.28±15.84	F=220.965	<0.001
Screening positive, n (%)	195 (15.4)	10 136 (35.6)	43 (47.8)	$\chi^2=225.206$	<0.001
Severity, n (%)				$\chi^2=245.460$	<0.001
None	1074 (84.6)	18372 (64.4)	47 (52.2)		
Mild	145 (11.4)	5475 (19.2)	18 (20.0)		
Moderate	40 (3.2)	3171 (11.1)	15 (16.7)		
Severe	10 (0.8)	1490 (5.2)	10 (11.1)		

*Post hoc Student–Newman–Keuls (S–N–K) test showed statistically significant group differences among all the three groups. ZSAS, Zung Self-rating Anxiety Scale; ; ZSDS, Zung Self-rating Depression Scale.

marriage, medical divisions, whether a doctor or nurse, whether working at isolation wards, whether working at fever clinics and having family member infected. Variables of *nurse* (OR=1.628, $p=0.014$), *with an infected family member* (OR=3.186, $p=0.006$) and *whether working at isolation wards* (OR=2.197, $p=0.004$) entered the regression model of the screening positive for depression (the model $\chi^2=23.037$, $df=3$, $p<0.0001$, Cox and Snell $R^2=0.025$, overall classification percentage=85.1%). Variables of *nurse* (OR=1.560, $p=0.025$), *with an infected family member* (OR=4.041, $p<0.0001$) and *whether working at fever clinics* (OR=2.194, $p=0.005$) entered the regression model of the screening positive for anxiety (the model $\chi^2=20.892$, $df=3$, $p<0.0001$, Cox and Snell $R^2=0.019$, overall classification percentage=87.6%) (refer to [table 3](#)).

Associated factors of ZSDS and ZSAS of the public group

Group differences of means and screening positive rates of ZSAS and ZSDS among the public group

One-way ANOVA or t-test outcomes for group differences of ZSAS SS and ZSDS SS means suggested that age, gender, educational levels, marriage status and having enough masks for 1 week may affect the ZSDS SS or ZSAS SS and screening positive rates for depression and anxiety. People with primary education exhibited the highest screening positive rate for depression (56.3%) and anxiety symptoms (30.8%) than those with other educational levels. People aged <24 and 25–34 years suffered higher rates of depression (37.0%, 33.4%) and anxiety (28.6%, 25.2%) than individuals of other age groups. Factors such as gender and having enough masks as well as locations also influenced the SS means of ZSDS or ZSAS and screening positive rates for depression or anxiety ([table 4](#)).

Logistic regression for screening negative or positive for depression and anxiety symptoms in the public

As per the results of stepwise binary logistic regression analysis, variables of *age* (group of >55 years old as the reference category), *educational level* (group of postgraduates as the reference category), *having contracted with confirmed cases*, *gender* (male as the reference), *having not enough masks* and *marriage* (single group as the reference category) enter the regression model ($\chi^2=321.659$, $df=14$, $p<0.0001$; Cox and Snell $R^2=0.028$; overall classification percentage=77.2%).

Variables of *educational level* (group of postgraduates as the reference category), *age* (group of >55 years old as the reference category), *gender* (male as the reference), *having not enough masks*, *marriage* (single group as the reference category) and *location distance from Hubei* entered the regression model for screening positive for depression symptoms ($\chi^2=396.076$, $df=16$, $p<0.0001$; Cox and Snell $R^2=0.044$; overall classification percentage=70.1%). Refer to [table 5](#) for details.

DISCUSSION

This study throws light on the acute psychological responses of anxiety or depression symptoms of the public, medical staff and patient groups under the COVID-19 pandemic by a nationwide online self-assessment in China. Patients showed significant anxiety or depression symptoms than the other two groups of the public and medical staff, and the respondents of the medical staff group maintained the best mental health status. With regard to the public group, age, educational

Table 2 Relevant factors of ZSAS and ZSDS of the medical staff

	ZSAS (n=1470)		ZSDS (n=1242)	
	SS (MS)	Positive (%)	SS (MS)	Positive (%)
Age (years)				
20–29	38.26±9.33†	76/538 (14.1)	40.61±12.14‡	89/480 (18.5)
30–39	37.91±9.47	79/653 (12.1)	38.56±11.40	69/536 (12.9)
40–49	37.77±10.07	32/221 (14.5)	37.99±11.64	27/179 (15.1)
50–62	34.97±9.67	6/58 (10.3)	34.19±9.92	3/47 (6.4)*
Gender				
Male	36.08±8.94	27/294 (9.2)	36.93±11.05	26/244 (10.7)
Female	38.37±9.62**	171/1202 (14.2)*	39.78±11.97**	169/1020 (16.6)*
Educational levels				
Senior or technical school	41.67±10.47§	6/27 (22.2)	44.95±15.07¶	7/22 (31.8)
College	38.35±9.46	142/1037 (13.7)	39.83±11.88	143/876 (16.3)
Postgraduate	36.68±9.51	52/438 (11.9)	37.42±11.30	45/371 (12.1)
Marriage status				
Single	37.83±9.07	72/555 (13.0)	40.34±12.08††	89/494 (18.0)
Married	38.02±9.79	125/913 (13.7)	38.56±11.66	103/744 (13.8)
Divorced	37.18±10.00	3/33 (9.1)	37.43±11.11	3/30 (10.0)
Doctor or nurse				
Doctor	37.13±9.17	52/471 (11.0)	37.93±11.15	44/382 (11.5)
Nurse	38.82±9.31**	92/635 (14.5)	40.27±12.19**	103/563 (18.3)**
Working at isolation wards				
Yes	41.13±9.91**	29/134 (21.6)**	42.45±12.78**	27/105 (25.7)**
No	37.58±9.41	169/1362 (12.4)	38.90±11.69	167/1158 (14.4)
Working at fever clinics				
Yes	39.95±10.94*	31/150 (20.7)**	40.02±13.11	20/112 (17.9)
No	37.70±9.33	168/1345 (12.5)	39.12±11.70	174/1150 (15.1)
Family member infected				
Yes	45.08±10.36**	15/37 (40.5)**	47.50±14.39**	13/30 (43.3)**
No	37.76±9.44	185/1463 (12.6)	39.02±11.71	182/1237 (14.7)

*P<0.05; **p<0.01

†One-way analysis of variance (ANOVA) F=2.104, p=0.098, post hoc S-N-K: two subsets for alpha=0.05: >50 and all other age groups.

‡One-way ANOVA F=6.352, p<0.0001, post hoc S-N-K: two subsets for alpha=0.05: group of >50 and all other age groups.

§One-way ANOVA F=6.911, p=0.001, post hoc S-N-K: two subsets for alpha=0.05: groups of college and postgraduate, and group of senior or technical school.

¶One-way ANOVA F=8.151, p<0.0001, post hoc S-N-K: two subsets for alpha=0.05: groups of college and postgraduate, and group of senior or technical school.

††One-way ANOVA F=3.745, p=0.024, multiple comparisons of least significant difference (LSD): group differences of mean ZSDS SS between single and married were significant, p=0.009.

MS, Mean±SD; SS, scale standardised score; ZSAS, Zung Self-rating Anxiety Scale; ZSDS, Zung Self-rating Depression Scale.

levels, whether having enough masks and marital status were relevant factors for the occurrence of anxiety or depression symptoms. Simultaneously, the medical staff with an infected family member, worked at an isolation ward or fever clinic or serviced as a nurse faced a high risk of depression or anxiety symptoms.

Generally, patients with COVID-19 were considered at the highest risk of psychiatric illness, especially during the acute phase, comorbid anxiety and depression symptoms as the most frequent. Zhang *et al*²⁰ reported the results of the psychiatric contact consultation to 105 patients with COVID-19 in isolated wards and showed that the

prevalence of anxiety and depression in 105 patients was 61.9% and 25.7%, respectively. Rogers *et al*² conducted a systematic review and meta-analysis about the psychiatric and neuropsychiatric presentations of severe acute respiratory syndrome (SARS), Middle East respiratory syndrome and COVID-19. The results showed depressed mood (32.6%), anxiety (35.7%), insomnia and impaired memory were the most common psychiatric symptoms during the acute stage except the organic confusion symptoms. In agreement with the earlier studies, this study found that patients with COVID-19 were at high risk of poor mental health, and they exhibited a screening

Table 3 Relevant factors of screening positive for depression or anxiety symptoms among medical staff by stepwise logistic regression analysis

	B	SE	Wald	df	Significance	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Screening positive for depression								
Nurse	0.488	0.199	6.006	1	0.014	1.628	1.103	2.405
Family member infected	1.159	0.420	7.603	1	0.006	3.186	1.398	7.260
Working at isolation ward	0.787	0.272	8.402	1	0.004	2.197	1.290	3.742
Screening positive for anxiety								
Nurse	0.445	0.199	4.996	1	0.025	1.560	1.056	2.303
Family member infected	1.396	0.388	12.936	1	<0.001	4.041	1.888	8.649
Working at fever clinics	0.786	0.279	7.912	1	0.005	2.194	1.269	3.792

positive rate of the anxiety of 48.7% and depression of 47.8%. The unpredictable development trend of COVID-19 brings more stressful and helpless experiences to patients, and they might have to confront more severe impacts on the mind during the acute and long-term

phases. A cohort study of 90 patients with SARS conducted by Mak *et al*²¹ evidenced 25.6% of patients diagnosed with post-traumatic stress disorder, 15.5% as depressive disorders and 16.5% as anxiety disorders at 30 months post-SARS. Therefore, patients with COVID-19 are likely the

Table 4 Relevant factors of ZSAS and ZSDS of the public group

	ZSAS		ZSDS	
	SS (MS)	Positive (%)	SS (MS)	Positive (%)
Age (years)				
<24	43.42±11.10†	826/2888 (28.6)**	45.09±16.71‡	839/2268 (37.0)**
25–34	42.65±10.43	1520/6039 (25.2)	46.92±13.48	1316/3945 (33.4)
35–44	40.11±10.12	607/3342 (18.2)	42.74±12.63	461/2024 (22.8)
45–54	38.70±9.62	154/1057 (14.6)	41.16±11.94	115/656 (17.5)
>55	37.47±8.70	33/301 (11.0)	39.26±11.93	26/167 (15.6)
Gender				
Male	40.76±10.47	1019/5098 (20.0)	43.84±13.44	838/3221 (26.0)
Female	42.37±10.58**	2278/9126 (24.9)**	46.97±13.63**	2049/6207 (33.0)**
Educational level				
Primary	45.45±11.78§	36/117 (30.8)**	53.63±14.33¶	49/87 (56.3)**
Junior	43.30±10.80	261/977 (26.7)	48.98±14.63	250/618 (40.5)
Senior/technical	42.68±10.85	482/1961 (24.6)	46.85±14.32	443/1336 (33.2)
College	41.63±10.48	2219/9726 (22.8)	45.56±13.40	1906/6459 (29.5)
Postgraduate	40.71±10.28	326/1563 (20.9)	44.27±13.00	258/990 (26.1)
Marriage				
Single	43.20±10.88††	1734/6217 (27.9)**	48.27±14.11‡‡	1678/4559 (36.8)**
Married	40.69±10.05	1444/7474 (19.3)	43.55±12.71	1104/4535 (24.3)
Divorced	41.56±11.27	110/488 (22.5)	46.16±13.45	96/299 (32.1)
Widowed	38.60±11.89	9/58 (15.5)	43.13±15.32	9/40 (22.5)
Having enough masks				
Yes	41.05±10.31	1699/8069 (21.1)	44.83±13.42	1456/5286 (27.5)
No	42.72±10.73**	1611/6287 (25.6)**	47.16±13.75**	1427/4188 (34.1)**

*P<0.05; **p<0.01.

†One-way analysis of variance (ANOVA) F=85.793, p<0.0001; S-N-K: four subsets for alpha=0.05: >55, 45–54, 35–44, and 25–34 and <24.

‡One-way ANOVA F=88.700, p<0.0001; S-N-K: five subsets for alpha=0.05: >55, 45–54, 35–44, 25–34 and <24.

§One-way ANOVA F=16.662, p<0.0001; S-N-K: four subsets for alpha=0.05: postgraduate and college, senior/technical school, junior school and primary school.

¶One-way ANOVA F=21.201, p<0.0001; S-N-K: four subsets for alpha=0.05: postgraduate and college, senior/technical school, junior school and primary school.

††One-way ANOVA F=67.220, p<0.0001, S-N-K: three subsets for alpha=0.05: widowed, married and divorced, and single.

‡‡One-way ANOVA F=94.184, p<0.0001, S-N-K: two subsets for alpha=0.05: widowed and married and divorced, and single.

MS, Mean±SD; SS, scale standardised score; ZSAS, Zung Self-rating Anxiety Scale; ZSDS, Zung Self-rating Depression Scale.

Table 5 Relevant factors of screening positive for depression or anxiety symptoms in public by stepwise logistic regression analysis

	B	SE	Wald	df	Significance	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Screening positive for anxiety symptoms								
Female	0.329	0.046	51.364	1	<0.001	1.389	1.270	1.520
Educational levels			34.397	4	<0.001			
Primary school	0.673	0.244	7.607	1	0.006	1.959	1.215	3.160
Junior school	0.452	0.105	18.574	1	<0.001	1.571	1.279	1.929
Senior school	0.326	0.089	13.419	1	<0.001	1.385	1.163	1.648
Marriage			33.990	3	<0.001			
Married	-0.314	0.056	31.292	1	<0.001	0.730	0.654	0.815
Confirmed case contact	0.466	0.136	11.696	1	0.001	1.594	1.220	2.082
Not enough mask	0.228	0.042	29.215	1	<0.001	1.256	1.156	1.364
Age			56.436	4	<0.001			
<24	0.808	0.202	16.036	1	<0.001	2.244	1.511	3.333
25-34	0.817	0.194	17.660	1	<0.001	2.263	1.546	3.312
35-44	0.502	0.195	6.617	1	0.010	1.652	1.127	2.423
Screening positive for depression symptoms								
Female	0.374	0.053	50.261	1	<0.001	1.453	1.311	1.612
Educational levels			97.082	4	<0.001			
Primary school	1.569	0.262	36.003	1	<0.001	4.802	2.877	8.018
Junior school	0.790	0.121	42.926	1	<0.001	2.204	1.740	2.791
Senior school	0.457	0.102	20.089	1	<0.001	1.579	1.293	1.928
Marriage			43.723	3	<0.001			
Married	-0.409	0.065	39.937	1	<0.001	0.664	0.585	0.754
Not enough mask	0.279	0.048	33.890	1	<0.001	1.322	1.203	1.452
Distance from Hubei			7.995	3	0.046			
Middle	-0.211	0.111	3.649	1	0.056	0.809	0.652	1.006
Age			61.926	4	<0.001			
<24	0.797	0.239	11.144	1	0.001	2.219	1.390	3.544
25-34	0.847	0.231	13.411	1	<0.001	2.332	1.482	3.670

high-risk population and in need of psychological intervention. The early diagnosis and timely intervention may aid in reducing future psychiatric morbidity. In China, as a part of the treatment and prevention policy, a total of 450 psychiatrists or psychologists provided mental assessment, psychiatric contact consultation and psychological intervention by the bedside in isolated wards²⁰ in Hubei province according to the guideline of the national health authority. Huang *et al*²² reported the prevalence of anxiety or depression of 1733 patients with COVID-19 discharged from hospital for 6 months was 23%. Combined with the present study's findings, the incidence of emotional disturbances in patients would decrease with the recovery, which may be related to the pathological mechanism of the disease, environmental changes and psychological interventions and other factors.

The extensive spread of this infectious and fatal disease may inevitably affect the public's mental health, especially during the initial phase due to huge uncertainty caused by

the lack of knowledge regarding it. The systematic review and meta-analysis study by Salari *et al*⁶ showed the prevalence of anxiety and depression was 31.9% and 33.7% in the general population during the COVID-19 pandemic, respectively. These findings supported the present study results in which the screening positive rate of anxiety and depression in the public was 25.7% and 35.6%, respectively. As to the relevant factors, in agreement with the earlier studies,^{8 23-25} this study also found female gender, younger age and lower educational levels are risk factors for people to be anxious and depressed. It was also found that whether having enough precautional material such as masks does not affect the mental status of the public. All these outcomes suggest that the high-risk population needs to be paid more attention and needs psychological intervention for COVID-19 in the future. Supporting with adequate precautional material may be the basis of the intervention. Dealing with the maladaptation to the living pattern adjustments and reconstructing the distorted

cognitions regarding the epidemic or responses of mind and body should be the key tasks of the psychological intervention.^{26 27} In China, many professional institutes of mental health in every city have set up several hot lines through telephone or mobile internet. All these services are entirely free for the public as these are critical to people in severe psychological crisis.²⁸ Additionally, as to the children and adolescents, they could have some particular emotional and behavioural reactions due to various stressful factors under the background of the COVID-19 pandemic. This study directly or indirectly reflected their mental health level by evaluating depression or anxiety symptoms. They should be paid more comprehensive attention in psychological assessments and interventions.

Undoubtedly, in this serious public health issue, the medical staff played a key role. While they worked hard to treat and care for the patients, they made great efforts to prevent themselves from infection of COVID-19. It is understood that the medical staff, especially those working at the front line against the virus, were in a highly stressful state. However, they were observed to exhibit the lowest screening positive rate of 13.3% for anxiety or 15.4% for depression symptoms than the patients and the public. This finding was similar to a multicentre study in medical staff which reported the overall prevalence of anxiety and depression of 13.9% and 16.1% among 274 responders.²⁹ The main factors contributing to the low positive rates might be as follows: (1) The time this study investigated was very early in the outbreak. Except in Wuhan and Hubei provinces, medical staff in other districts hardly were exposed to confirmed patients. So, overall, the level of psychological stress was low. (2) The data sources were mainly from Guangdong (57.3%), especially Guangzhou, which were related to the design and promotion of this online survey by a hospital in Guangzhou. A small number of participants from other regions, especially Hubei province (3.1%), were involved in the investigation. (3) In terms of personnel composition, the medical personnel working at the front line represent only a tiny proportion (10%) of the total. As to the front-line workers, the medical staff who work at the isolation wards exhibited significantly higher anxiety (21.6%) or depression (25.7%) screening positive rates in this present study. This finding was in line with a study focused on 332 front-line health professionals in Wuhan City, which reported the prevalence of anxiety and depression symptoms of 24.7% and 20.2%.¹¹ In agreement with certain other studies, the nurse was also more vulnerable to anxiety or depression than doctors.^{11 30} Furthermore, this study revealed another critical risk factor to the emotional disturbance that had not been emphasised much. Medical staff with one or more family members infected by COVID-19 appeared to be three to four times riskier to anxiety or depression than those not in such a situation. Thus, these medical staff should be more focused on psychological intervention. Allowing them to have adequate time to look after their families and relieving them of the guilt of causing the infection among

their relatives may help in the psychological intervention. In China, by nationally activating medical staff from other provinces to Hubei and locally activating medical staff in other cities or hospitals to COVID-19-focused hospitals, the government could achieve enough medical staff at the front line and optimal work routine and rest time for medical workers. Certainly, the government nationally gathered enough personal prevention instruments for the health workers. All these measures from the national or the individual level have produced prevailing strength against the virus, and at the same time protect the body and mind health of the front-line medical staff.

Here are some limitations of this study. Due to suffering from somatic illness, restrictive treatment circumstances and the limitation of the casting range, it was difficult to acquire the patients' mental health data by either interviewing or online survey at the initial stage of the pandemic. The number of patients participating in this survey was comparably quite small compared with those of the public or medical staff groups. This sample difference perhaps influenced the reliability of the statistical results. The participants could not be instructed and supervised to complete the questionnaires independently, which may have caused several counts of missing values and the relatively low rate of responses for the ZSDS and ZSAS. All these might affect the statistical results. Scales of ZSAS and ZSDS could mainly evaluate the emotional symptoms and not directly reveal the stress reactions. Moreover, no other valid pathway was available to authenticate the respondents' identifications except by way of the entrances they chose.

CONCLUSION

In conclusion, the COVID-19 outbreak has resulted in varying extents of psychological effects on the public, medical staff and patients. Nearly half of the patients had anxiety and depression symptoms, according to this survey. The front-line medical staff, especially nurses and those with an infected family member, are at high risk of emotional disturbances. Regarding the public, youngsters, females, those with lower educational levels and people lacking masks are more likely to feel anxious or depressed. These populations require immediate psychological intervention in case of severe mental disorders. It is important to encourage the high-risk public or patients and the medical staff to seek psychiatric help from specialists and undergo clinical diagnosis and therapy by the psychiatrist. At the same time, the professionals should give more advice via various media for them to adjust to mind rebalance. The government should support more psychological intervention facilities for them to use, for example, make policy to build or strengthen online consulting, and more importantly, the online hospitals. People under great stress could easily get psychological help, even medicine therapy from specialists at the remote terminals.

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