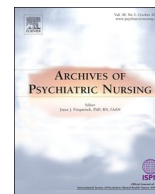




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## The psychological effect of 2019 coronavirus disease outbreak on nurses living in Islamic culture dominant region, China



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### Background

The outbreak of Coronavirus Disease (COVID-19) in Wuhan (WHO, 2020a), which began at the end of 2019 (Mahase, 2020), has caused an unprecedented global health challenge (Choi, Heilemann, Fauer, & Mead, 2020). The COVID-19, also called Novel Coronavirus Pneumonia, is the human-to-human transmitted lower respiratory tract infection disease, while its pathogenicity and transmissibility remain unknown (WHO, 2020b). The current COVID-19 is of primary global concern and has been categorized by the World Health Organization (WHO) as a Public Health Emergency of International Concern (PHEIC) and assessed as very high risk at the global level.

A vast body of literature on disaster mental health had found that emotional distress is ubiquitous among populations during public health emergencies (Pfefferbaum & North, 2020). COVID-19 pandemic is a challenge to affect us not only physically, but also mentally (Ahmad, Mueller, & Tsamakidis, 2020). Facing uncertain infectious threats, we should pay attention to the mental health of nurses based on our experience with other respiratory coronavirus diseases, such as the Severe Acute Respiratory Syndrome (SARS) (Xiang et al., 2020). In the struggle against COVID-19, nurses are the vulnerable population who constitute the largest workforce within medical systems internationally (Hall et al., 2003; Maunder et al., 2003).

According to Zangaro et al. research, racial and ethnic diversity has a sharp increase among the nursing workforce since the 21st century (Zangaro, Streeter, & Li, 2018). However, little is known about the responses of minority ethnicity to public emergency outbreak, especially the medical staff. China is a multi-ethnic society, and the ethnic regional autonomy system is one of China's basic political systems. Gansu province, situated in northwestern China, offers astonishing cultural and ethnic diversity. Linxia Hui Autonomous Prefecture, Gansu, is one of the two Chinese only Hui Autonomous Prefecture. Autonomous prefectures are equivalent to city-level administrative units. Linxia Hui Autonomous Prefecture is a multi-ethnic residential city and is influenced profoundly by Islamic culture. Nurses with different ethnicities have different responses to the same stressor (Jiang,

2009) since culture influences medical care providers' perceptions. As a multi-ethnic residential city, nurses working in Linxia Hui Autonomous Prefecture may have different perceptions of emerging infectious disease outbreak due to the influence of Islamic culture. However, it is unknown how much it affects frontline nurses' perceptions of the emerging infectious disease outbreak.

The purpose of this study was to investigate the psychological characteristics of nurses with minority ethnic backgrounds in response to the public health crisis and to explore its related factors. The findings may offer new insight into nurses' response to an infectious disease outbreak and build cultural awareness for nursing professionals.

### Methods

#### Setting and procedures

We undertook a cross-sectional online survey in the Linxia Hui Autonomous Prefecture, through an online crowdsourcing platform in mainland China, which provided functions equivalent to Amazon Mechanical Turk. A total of 1648 participants were voluntarily recruited and enrolled in our survey, working in nine hospitals, six of which were COVID-19-designated hospitals. The questionnaire was administered between February 6th and February 10th, 2020. Questionnaires with answer time less than 5 min, the same rating responses were elicited for all questions, and had invalid responses for age or years of working were excluded. In the end, 1569 returned questionnaires were included and analyzed (valid response rate of 95.2%).

#### Ethical consideration

Ethical approval for this study has been granted by the ethics committee of Gansu Provincial People's Hospital (No. 2020-011). The participants were explained the research procedures, and it was emphasized that the results would remain anonymous, and agreed respondents were asked to sign a consent before completing the self-

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report questionnaire.

### Instruments

The structured questionnaire consisted of four parts:

#### 1) Demographic questionnaire

The demographic questions included gender, age, educational level, marital status, work position, years of working, department, need to take care of children or elders, voluntary to be the reserve personnel to provide medical assistance to Wuhan, and so forth.

#### 2) “COVID-19” related questionnaire

For the present study, a 19-item questionnaire tailored to nursing workers was developed by the researchers, which was chosen based on the available literature on the perceptions and opinions of experts regarding infectious disease outbreaks (Goulia, Mantas, Dimitroula, Mantis, & Hyphantis, 2010). Items were grouped in four domains: (a) nurses' concerns and worries about the “COVID-19”, e.g. “Knowledge of the “COVID-19”, “concerned information”; (b) effects of “COVID-19” on nurses, e.g. “what pneumonia affects you most is”, “recent sleep situation compared to the past”, etc.; (c) expected behavior, e.g. “possible to avoid the occupational duty”, “avoidance to work”; and (d) social support, e.g. “outside views on medical staff”, “satisfaction with outside material assistance” (Table 2 shows the detailed questionnaire items).

#### 3) Self-rating Anxiety Scale, SAS

The anxiety levels of nurses were measured using the 20-item Self-rating Anxiety Scale developed by Zung (1971). This 20-item scale has a wide range of applications, of which 15 are positive scores, and 5 are negative scores. A 4-point Likert scale is employed to evaluate each item (e.g. 1 = never or some of the time, 4 = most of the time), yielding a totally original score ranging from 20 to 80. The total standard score was recorded as the original score (the sum of 20 items) multiplied by 1.25, so the score range is 25 to 100. The higher the score, the higher the anxiety level. A total score of  $\geq 50$  points was considered as the cut off for experiencing anxiety symptoms in the Chinese population. A standard score of 50–59 points indicated mild anxiety, 60–69 points indicated moderate anxiety, and  $> 70$  points signified severe anxiety (Kong et al., 2013). In this study, the Cronbach's  $\alpha$  coefficient of the scale was 0.865.

#### 4) Self-rating Depression Scale, SDS

The 20-item Self-rating Depression Scale developed by Zung (1965) was used to assess depression symptoms. This scale is commonly used to measure depression symptoms in the population over the past week, including subjective feelings of emotional, psychological, and physical aspects (Gong et al., 2014). Each item is rated on a 4-point Likert scale and ranges from 1 (never or some of the time) to 4 (most of the time). The total possible standard score, ranging from 25 to 100, was obtained by multiplying the total original score by 1.25. According to the results of Chinese norms, the boundary value of SDS was 53 points, a standard score of 53–62 points indicated mild depression, 63–72 points indicated moderate depression, and  $> 72$  points signified severe depression (Liu et al., 2013). The Cronbach's  $\alpha$  coefficient of this scale was 0.892.

### Statistical analysis

The Statistical Package for the Social Sciences 22.0 (SPSS) for Windows was used for analysis. Descriptive analysis of socio-demographic data, work-related characteristic variables, and self-perceived physical health status were performed. The enumeration data was

**Table 1**

Demographic and psychological characteristics of nurses (N = 1569).

Item	N (%)
Gender	
Male	19(1.2)
Female	1550(98.8)
Age, y (M $\pm$ SD: 30.93 $\pm$ 6.484)	
< 30	740(47.2)
30–40	677(43.1)
$\geq 40$	152(9.7)
Education level	
Secondary school and below	156(9.9)
Junior college	934(59.5)
College or above	479(30.5)
Marital status	
Single	399(25.4)
Married	1170(74.6)
Need to care for children	
Yes	1002(63.9)
No	567(36.1)
Need to care for elders	
Yes	1328(84.6)
No	241(15.4)
Department	
High exposure department	393(25.0)
Non-high exposure department	1176(75.0)
Years of working, y (M $\pm$ SD: 31.02 $\pm$ 6.324)	
< 10	971(61.9)
$\geq 10$	598(38.1)
Work position	
Frontline nursing worker	1520(96.9)
Nursing administrators	49(3.1)
Experience of caring for a confirmed or suspected case with “COVID-19”	
Yes	59(3.8)
No	1510(96.2)
Reserve personnel to assist Wuhan	
Yes	414(26.4)
No	1155(73.6)
Anxiety level (M $\pm$ SD: 42.56 $\pm$ 8.957)	
Normal	1250(79.7)
Mild	251(16.0)
Moderate	58(3.7)
Severe	10(0.6)
Depression level (M $\pm$ SD: 46.52 $\pm$ 11.883)	
Normal	1055(67.2)
Mild	387(24.7)
Moderate	104(6.6)
Severe	23(1.5)

expressed as frequencies and percentages. Measurement data was expressed as mean  $\pm$  standard deviation (M  $\pm$  SD). The independent sample two-tailed *t*-test was used to evaluate differences in the mean in dichotomous variables, and One-way ANOVA was used to evaluate differences in the mean value of categorical variables. Stepwise multiple regression analysis was used to identify the influencing factors of anxiety and depression. The independent variables were the factors with statistically significant differences in univariate analysis such as gender, COVID-19-designated hospital (yes, no), age ( $< 30$  years old, 30–40,  $\geq 40$  years old).  $P < 0.05$  was considered statistically significant.

### Results

#### Demographic and psychological characteristics (Table 1)

The majority of the nurses were women (98.8%), the mean age of the participants was 30.93  $\pm$  SD 6.484, and the mean working years was 31.02  $\pm$  SD 6.324, holders of a junior college degree (59.5%), married (74.6%), needed to care for children (63.9%) or elders (84.6%), non-reserve personnel to assist Wuhan (73.6%) and worked at non-high exposure departments (75%) in secondary hospital (66.9%) or

**Table 2**  
“COVID-19” related questionnaire.

Item	N (%)
Nurses' concerns and worries about the “COVID-19”	
Knowledge of the “COVID-19”	
Little understanding	5(0.3)
Unconversant	109(6.9)
Understand better	1145(73.0)
Know a lot about	310(19.8)
The desire to learn about “COVID-19”	
Without	7(0.4)
Little	26(1.7)
Relatively large	508(32.4)
Very large	1028(65.5)
The most need to update knowledge about the “COVID-19”	
Symptoms	766(48.8)
Prognosis	1215(77.4)
Transmission	882(56.2)
Prevention	1073(68.4)
Treatment	1233(78.6)
Concerned information	
Outbreaks	1213(77.3)
New preventive measures	1421(90.6)
Progress in scientific research	1306(83.2)
Social stability	1186(75.6)
Information source about the “COVID-19”	
Media	1559(99.4)
Family and friends	510(32.5)
Hospital learning	966(61.6)
People talk about	215(13.7)
During the “COVID-19”, top three concerns	
Fear of family and friends will be infected	1237(78.8)
Lack of protective gear	944(60.2)
Fear of contagion	720(45.9)
Possibility of infection by yourself or others around you	
No possibility	137(8.7)
Little possibility	579(36.9)
Some possibility	507(32.3)
More likely	346(22.1)
The effects of “COVID-19” on nurses	
What pneumonia affects you most is	
Work and study	441(28.1)
Daily life	685(43.7)
Mood status	234(14.9)
Family reunion	209(13.3)
Recent sleep situation compared to the past	
Sleepless night	31(2.0)
Hard to fall asleep	319(20.3)
Slightly difficult	781(49.8)
Same as before	438(27.9)
Are you easily upset recently	
No	212(13.5)
Occasionally	407(25.9)
Sometimes	647(41.2)
Frequently	303(19.3)
Whether need psychological assistance at present	
Never considered	283(18.0)
Do not need	1088(69.3)
Need	151(9.6)
In great request	47(3.0)
Expected behavior	
Avoidance to work	
Yes	10(0.6)
No	1559(99.4)
Possible to avoid the occupational duty	
Not at all possible	976(62.2)
Not possible	569(36.3)
Possible	23(1.5)
In all probability	1(0.1)
Restriction of social activities	
Yes	1189(75.8)
No	380(24.2)
Interpersonal isolation	
Yes	1156(73.7)
No	413(26.3)
Social support	
Outside views on medical staff	

**Table 2 (continued)**

Item	N (%)
Hostile	35(2.2)
Not very friendly	193(12.3)
Friendly	895(57.0)
Very friendly	446(28.4)
Satisfaction with outside material assistance	
Not very satisfied	43(2.7)
Ordinary	166(10.6)
Be fairly satisfied	585(37.3)
Very satisfied	775(49.4)
Acceptance of epidemics management	
Too strict	3(0.2)
Strict	127(8.1)
Should accept	264(16.8)
Accept	1175(74.9)
Outside views on medical staff	
Too strict	3(0.2)
Strict	127(8.1)
Should accept	264(16.8)
Accept	1175(74.9)

COVID-19-designated hospital (85.4%). As for the psychological variables, 16% of nurses had mild anxiety, 3.7% had moderate anxiety, and 0.6% had severe anxiety. With respect to depression, 24.7% of nurses had mild depression, 6.6% had moderate depression, and 5.5% had severe depression. Detailed data about recruited participants are presented in [Table 1](#).

“COVID-19” related questionnaire ([Table 2](#))

*Concerns and worries about the “COVID-19”*

19.8% of the participants said they knew a lot about the “COVID-2019”, and the primary sources of information were from the media (99.4%) and hospital learning (61.6%). There were 65.5% of nurses who were very eager to acquire the knowledge of “COVID-19”. The knowledge that needed to be supplemented were, in descending order, treatment (78.6%), prognosis (77.4%), prevention (68.4%), transmission (56.2%), and symptoms (48.8%). The two most concerning pieces of information about the “COVID-19” were new preventive measures (90.6%) and the progress in scientific research (83.2%). There were 22.1% of nurses thinking they or those around them were more likely to be infected with “COVID-19”. During the “COVID-19”, the top three concerns were the fear that family and friends would be infected (78.8%), lack of protective gear (60.2%), and fear of contagion (45.9%).

*Effects of “COVID-19” on nurses and expected behavior*

The most significant influences of “COVID-19” on nurses were, in descending order, daily life (43.7%), work and study (28.1%), mood status (14.9%), and family reunion (13.3%). There were 72.1% of nurses with different degrees of sleep disorders, and 86.5% of them were easily upset. Besides, 12.6% of nurses thought they needed psychological assistance at present. There were 75.8% who would take the initiative to limit their social activities because their work environment was considered “dangerous”, and 73.7% thought they would avoid contact with family and friends (interpersonal isolation) because they worked in a “high-risk” environment. Only 0.6% of nurses would take leave to avoid going to work, and 1.6% would avoid their occupational duties in an emergency due to the “COVID-19”. More details are presented in [Table 2](#).

*Influencing factors of nurses' anxiety and depression ([Table 3](#))*

The mean anxiety of the participants was 42.56 ± SD 8.957, and the mean depression was 46.52 ± SD 11.883. Age, need to take care of elders, years of working, working in a designated hospital, knowledge

**Table 3**  
Association of demographic characteristics, COVID-19 related concern, impact of the COVID-19 on nurses with anxiety and depression (N = 1569).

Independent variables	N(%)	Anxiety			Depression		
		Mean ± SD	F/t	P	Mean ± SD	F/t	P
<b>Demographics</b>							
<b>Gender</b>							
Male	19(1.2)	39.47 ± 9.801	1.510	0.131	41.38 ± 11.718	1.899	0.058
Female	1550(98.8)	42.60 ± 8.943			46.59 ± 11.875		
<b>Age, y</b>							
< 30	740(47.2)	41.99 ± 8.727	3.514	0.030	45.61 ± 11.786	7.036	0.001
30–40	677(43.1)	43.24 ± 9.024			47.80 ± 11.915		
≥ 40	152(9.7)	42.30 ± 9.599			45.27 ± 11.738		
<b>Education level</b>							
Secondary school and below	156(9.9)	42.64 ± 7.223	0.164	0.848	47.08 ± 11.167	0.217	0.805
Junior college	934(59.5)	42.64 ± 9.222			46.41 ± 11.975		
College or above	479(30.5)	42.36 ± 8.957			46.56 ± 11.947		
<b>Marital status</b>							
Single	399(25.4)	41.89 ± 8.630	1.735	0.083	46.07 ± 11.588	0.890	0.374
Married	1170(74.6)	42.79 ± 9.058			46.68 ± 11.982		
<b>Need to care for children</b>							
Yes	1002(63.9)	42.98 ± 9.217	2.537	0.011	46.88 ± 11.944	1.596	0.111
No	567(36.1)	41.81 ± 8.436			45.89 ± 11.758		
<b>Need to care for elders</b>							
Yes	1328(84.6)	42.90 ± 9.052	3.620	< 0.001	46.82 ± 11.962	2.335	0.020
No	241(15.4)	40.64 ± 8.171			44.88 ± 11.322		
<b>Years of working, y</b>							
< 10	971(61.9)	42.06 ± 8.696	2.803	0.005	45.99 ± 11.777	2.281	0.023
≥ 10	598(38.1)	43.36 ± 9.317			47.39 ± 12.011		
<b>Work position</b>							
Frontline nursing worker	1520(96.9)	42.59 ± 8.987	0.694	0.488	46.60 ± 11.885	1.446	0.148
Nursing administrators	49(3.1)	41.68 ± 8.006			44.11 ± 11.684		
<b>Hospital level</b>							
Secondary	1049(66.9)	42.42 ± 8.813	0.869	0.385	46.33 ± 11.802	0.918	0.359
Tertiary	520(33.1)	42.84 ± 9.243			46.91 ± 12.047		
<b>Stressor</b>							
<b>COVID-19-designated hospital</b>							
Yes	1340(85.4)	42.79 ± 9.033	2.504	0.012	46.75 ± 12.036	1.973	0.049
No	229(14.6)	41.19 ± 8.389			45.19 ± 10.874		
<b>Working department</b>							
High exposure department	393(25.0)	43.25 ± 9.369	1.773	0.076	47.70 ± 12.366	2.279	0.023
Non-high exposure department	1176(75.0)	42.33 ± 8.807			46.13 ± 11.696		
<b>Experience of caring for a confirmed or suspected case with “COVID-19”</b>							
Yes	59(3.8)	44.07 ± 10.712	1.321	0.187	49.66 ± 11.769	2.070	0.039
No	1510(96.2)	42.50 ± 8.881			46.40 ± 11.874		
<b>Reserve personnel to assist Wuhan</b>							
Yes	414(26.4)	41.86 ± 8.920	1.840	0.066	45.33 ± 11.971	2.379	0.017
No	1155(73.6)	42.81 ± 8.962			46.95 ± 11.827		
<b>Possibility of infection by yourself or others around you</b>							
No possibility	976(62.2)	40.86 ± 8.457	22.079	< 0.001	45.20 ± 11.979	4.518	0.004
Little possibility	569(36.3)	40.81 ± 8.573			45.47 ± 12.062		
Some possibility	23(1.5)	43.06 ± 8.586			46.97 ± 11.304		
More likely	1(0.1)	45.41 ± 9.508			48.15 ± 12.187		
<b>Knowledge level related to “COVID-19”</b>							
Little understanding	5(0.3)	48.50 ± 7.148	2.806	0.038	60.25 ± 2.404	6.651	< 0.001
Unconversant	109(6.9)	44.24 ± 10.107			49.64 ± 12.822		
Understand better	1145(73.0)	42.58 ± 8.785			46.59 ± 11.664		
Know a lot about	310(19.8)	41.78 ± 9.105			44.94 ± 12.094		
<b>Desire to learn about “COVID-19”</b>							
Without	7(0.4)	43.39 ± 9.006	4.857	0.002	48.93 ± 12.362	12.695	< 0.001
Little	26(1.7)	44.28 ± 11.652			49.71 ± 12.541		
Relatively large	508(32.4)	43.72 ± 8.660			49.01 ± 11.462		
Very large	1028(65.5)	41.94 ± 8.976			45.20 ± 11.869		
<b>Coping strategies</b>							
<b>Avoidance to work</b>							
Yes	10(0.6)	47.38 ± 8.609	1.707	0.088	46.88 ± 11.921	0.940	0.925
No	1559(99.4)	42.53 ± 8.954			46.52 ± 11.886		
<b>Avoid the occupational duty</b>							
Not at all possible	976(62.2)	41.69 ± 8.938	13.624	< 0.001	45.19 ± 11.740	13.133	< 0.001
Not possible	569(36.3)	43.68 ± 8.418			48.47 ± 11.619		
Possible	23(1.5)	50.71 ± 14.241			54.46 ± 14.933		
In all probability	1(0.1)	57.50 ± 0.000			56.25 ± 0.000		
<b>Restriction of Social activities</b>							
Yes	1189 (75.8)	42.83 ± 9.125	2.169	0.030	46.69 ± 11.928	0.960	0.337
No	380(24.2)	41.69 ± 8.362			46.01 ± 11.741		
<b>Interpersonal isolation</b>							

(continued on next page)

**Table 3** (continued)

Independent variables	N(%)	Anxiety			Depression		
		Mean ± SD	F/t	P	Mean ± SD	F/t	P
Yes	1156(73.7)	42.91 ± 9.090	2.588	0.010	46.70 ± 11.900	0.971	0.332
No	413(26.3)	41.58 ± 8.511			46.04 ± 11.837		
<b>Social support</b>							
Outside views on medical staff							
Hostile	35(2.2)	47.96 ± 9.815	14.414	< 0.001	54.79 ± 11.794	12.348	< 0.001
Not very friendly	193(12.3)	44.86 ± 10.164			48.74 ± 12.585		
Friendly	895(57.0)	42.71 ± 8.878			46.71 ± 11.641		
Very friendly	446(28.4)	40.84 ± 8.052			44.54 ± 11.610		
Satisfaction with outside material assistance							
Not very satisfied	43(2.7)	49.10 ± 10.576	17.824	< 0.001	53.26 ± 12.489	13.356	< 0.001
Ordinary	166(10.6)	44.48 ± 9.225			48.43 ± 12.192		
Be fairly satisfied	585(37.3)	43.30 ± 8.888			47.70 ± 11.608		
Very satisfied	775(49.4)	41.22 ± 8.564			44.85 ± 11.708		
Acceptance of epidemics management							
Too strict	3(0.2)	51.67 ± 6.415	14.321	< 0.001	67.08 ± 4.390	22.893	< 0.001
Strict	127(8.1)	45.76 ± 8.535			50.71 ± 11.738		
Should accept	264(16.8)	44.54 ± 9.103			50.26 ± 11.823		
Accept	1175(74.9)	41.74 ± 8.823			45.18 ± 11.599		

of the “COVID-19”, the possibility of infection, possible to avoid the occupational duty, outside views on the medical staff, satisfaction with outside material assistance, acceptance of epidemics management were found to be significantly associated both with anxiety ( $P < 0.05$ ) and depression ( $P < 0.05$ ).

*Stepwise multiple regression analysis for anxiety (Table 4)*

Nurses who were older and needed to care for children, worked in COVID-19-designated hospital, desired knowledge related to COVID-19, and restricted social activities had high anxiety scores. It was found that the years of working, the possibility of infection, and sense of duty were positive correlations with anxiety ( $P < 0.05$ ). The need to care for elders, desire to learn about COVID-19, interpersonal isolation, and social support were negatively correlated with anxiety ( $P < 0.001$ ).

*Stepwise multiple regression analysis for depression (Table 5)*

Depression scores were higher for older nurses who were reserved personnel to assist Wuhan, needed to take care of elders, and worked in COVID-19-designated hospitals. The working department, the experience of caring for a confirmed or suspected case, knowledge level related to COVID-19, and social support were negatively correlated with depression ( $P < 0.001$ ). The years of working, fear of contagion and sense of duty had positive correlations with depression ( $P < 0.001$ ).

**Table 4**

Result of Stepwise multiple regression analysis for anxiety.

Model	Unstandardized coefficients		Standardized coefficients	t	P
	B	SE			
(Constant)	51.727	2.408		21.478	0.000
Possibility of infection by yourself or others around you	1.616	0.239	0.165	6.757	0.000
Acceptance of epidemics management*	-1.731	0.346	-0.122	-5.006	0.000
Outside views on medical staff*	-1.250	0.325	-0.097	-3.848	0.000
Avoid the occupational duty	1.760	0.422	0.102	4.171	0.000
Satisfaction with outside material assistance*	-1.084	0.295	-0.094	-3.678	0.000
Years of working	1.135	0.444	0.062	2.559	0.011
Need to care for elders*	-1.307	0.601	-0.053	-2.176	0.030
Desire to learn about “COVID-19”*	-0.884	0.408	-0.053	-2.167	0.030
Interpersonal isolation*	-0.986	0.494	-0.049	-1.995	0.046

Remarks:  $R^2 = 0.110$ ,  $F = 22.615$ ,  $P < 0.05$ .

\* Reverse item: the lower variable's score, the higher anxiety.

**Discussion**

To our best knowledge, this is the first study that investigates the psychological effect of COVID-19 pandemic on nurses living in Islamic culture dominant region. Compared with the findings among 2014 nurses using the same Zung's scale in February (Hu et al., 2020), the psychological impact of COVID-19 outbreak on nurses in the Linxia Hui Autonomous Prefecture were slightly affected. The anxiety and depression level of our results ( $M \pm SD$ :  $42.56 \pm 8.957$ ;  $46.52 \pm 11.883$ , respectively) is much lower than Hu et al. results ( $M \pm SD$ :  $47.8 \pm 11.2$ ;  $50.5 \pm 11.31$ , respectively).

The reason why the psychological outcomes of nurses in Islam culture dominant region were better than that of other Chinese nurses during the COVID-19 outbreak can be summarized as follow. Firstly, the Linxia Hui Autonomous Prefecture contains Dongxiang Autonomous County and Jishishan Baoan Dongxiang Salar Autonomous County. The Hui nationality, the Dongxiang nationality, the Baoan nationality, and the Salar nationality are ethnic minorities consisting of the Muslim population, which are part of fifty-six Chinese ethnic groups. Moreover, the Hui nationality ranks second in the number of population of the Chinese ethnic minority. Islam is the dominant religion and has a considerable impact on the Linxia Hui Autonomous Prefecture citizens' daily life. Muslims tend to be conservative and believe the view that Allah controls everything according to his will. Muslims do not eat pork or drink alcohol, however, Cheung's research found that nurse stress is associated with drinking alcohol (Cheung & Yip, 2015) that were related to substance abuse. Religious belief, which

**Table 5**  
Result of stepwise multiple regression analysis for depression.

Model	Unstandardized coefficients		Standardized coefficients	t	P
	B	SE	$\beta$		
(Constant)	72.764	3.760		19.351	0.000
Acceptance of epidemics management <sub>s</sub>	-2.824	0.462	-0.150	-6.111	0.000
Avoid the occupational duty	2.329	0.563	0.102	4.138	0.000
Outside views on medical staff <sub>s</sub>	-1.453	0.434	-0.085	-3.350	0.001
Desire to learn about "COVID-19" <sub>s</sub>	-1.867	0.554	-0.085	-3.372	0.001
Possibility of infection by yourself or others around you	1.028	0.316	0.079	3.257	0.001
Satisfaction with outside material assistance <sub>s</sub>	-1.190	0.395	-0.078	-3.015	0.003
Experience of caring for a confirmed or suspected case <sub>s</sub>	-3.727	1.513	-0.060	-2.463	0.014
Years of working	1.576	0.597	0.064	2.640	0.008
Knowledge level related to "COVID-19" <sub>s</sub>	-1.309	0.583	-0.057	-2.245	0.025
Working department <sub>s</sub>	-1.494	0.666	-0.055	-2.243	0.025

Remarks:  $R^2 = 0.098$ ,  $F = 18.043$ ,  $P < 0.05$ .

\* Reverse item: the lower variable's score, the higher depression.

forbids nurses to relieve their stress by depending on alcohol, has remarkable social and psychological influences that help them to sustain a similar pattern in their daily lives during the COVID-19 outbreak. Secondly, Gansu province is seated in northwestern China, while Hubei province is located in central China. The geographic distance between two provincial capital is more than 1000 km. Up to February 3, the number of confirmed cases in Gansu province is 53, meanwhile, that of Hubei province is nearly thirteen thousand (Fan, Liu, Pan, Douglas, & Bao, 2020). Thirdly, the SARS outbreak is an unprecedented public health crisis for China in the 21st century, but the experience we learned from SARS can help us to face the COVID-19 challenge. For example, the nursing procedures of caring for SARS patients have been compiled into professional textbooks. Besides, the case-fatality rate of COVID-19 (1.4%) is lower than SARS (9–10%) (Guan et al., 2020). Fourthly, in the past few decades, rapid progress and innovation have been achieved in medical technology. For instance, the extracorporeal membrane oxygenation (ECMO) can provide life support for acute respiratory failure patients (Zanella, Carlesso, & Pesenti, 2019).

Besides, the factors associated with the psychological health status are consistent with the result of Brooks, Dunn, Amlot, Rubin, and Greenberg's (2018) review, including training or preparedness, role-related stressor, social support, interpersonal isolation, perceived risk. The valuable findings of this study add new information to our understanding of the nurses with minority ethnic backgrounds in the face of the public health crisis.

According to our result about the COVID-19 effects on nurses and their concerns, several improvement measures are required. First of all, it is of high urgency to conduct COVID-19 related training programs for nurses. The global tendency of emerging infectious diseases is of growing significance over time (Jones et al., 2008). Our results showed that 97.9% of nurses have the desire to learn knowledge about COVID-19, and it points to where we need to improve. Facing the unknown nature of COVID-19, illness uncertainty easily causes fear, anxiety and depression, which has been reflected by a number of researchers (Marjanovic et al., 2007). Second, the media, as the nurses' dominant information source (99.4%), should take the responsibility of building a positive image of the nurse. The public's view on the medical staff is actually one of the nurses' social support. Media coverage can influence the social conception of nurses' roles (Hall et al., 2003). Social support negatively correlated with anxiety and depression levels (Su et al., 2007). The positive media portrayal of nurses can increase morale (Maunder, 2004). Third, it is vital to guarantee occupational safety. Nurses have direct contact with patients and have potential exposure to coronavirus contagion (Tzeng & Yin, 2006). The hospital should spend more effort to assure the supplies of personal protective equipment, such as gloves, face masks, gowns, which help nurses cope effectively and mitigate their fear of contagion (Maunder et al., 2003). Fourth,

government and institutions should provide credible support to nurses' families. The need to care for children or elders is a nurse role-related stressor. Consistent with Nickell's research (Nickell et al., 2004), more than two-thirds of nurses were concerned that their family members would be infected. Lastly, it is necessary to increase payment and provide benefits for nurses appropriately, owing to higher salary and better benefits are the strongest predictors of nurse retention (Buffington, Zwink, Fink, Devine, & Sanders, 2012; Hagan & Curtis, 2018). In order to relieve Wuhan's medical burden, the hospitals outside Hubei would send competent nurses to assist Wuhan, resulting in the local shortage of nursing workforce. To avoid the nurse's intention to leave, the matched bonus should be distributed to motivate nurses in their jobs.

Several limitations need to be mentioned. First, our analysis based on the cross-sectional survey only reflects the condition at the time that the data was gathered and did not track the dynamic change. Besides, we only collected data from one Islam culture dominant region and it is unable to represent the all Islam situation.

In light of our results, it is suggested that future research should expand the investigation to the other minority ethnic and monitor the dynamic trajectory with different stages of the public health emergency. Further exploration of the potential mechanism about how religious belief would affect how nurses encounter public health emergency is needed.

## Conclusion

In conclusion, our result reveals how nurses from ethnic minorities cope with emerging infectious diseases. Nurses who are of the Islamic culture are affected slightly by the COVID-19 outbreak, but their concern and factors associated with psychological variables are in keeping with the common nursing groups.

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