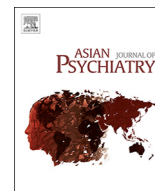




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A cross-sectional study on mental health among health care workers during the outbreak of Corona Virus Disease 2019

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ABSTRACT

The spread of Corona Virus Disease 2019 (COVID-19) has become a global major public health event, threatening people's physical and mental health and even life safety. This study is to investigate the psychological abnormality in health care workers battling the COVID-19 epidemic and to explore the associations among social support, resilience and mental health. A total of 1521 health care workers, of whom 147 had public health emergency experience while 1374 showed no experience, completed the Symptom Check-List-90 (SCL-90), Chinese version of Connor-Davidson resilience scale (CD-RISC) and Social Support Rating Scale (SSRS). χ^2 test, t test and multiple regression analyses were used in statistical analysis. The results showed that people without public health emergency treatment experience showed worse performance in mental health, resilience and social support, and tended to suffer from psychological abnormality on interpersonal sensitivity and phobic anxiety. This finding suggested that high levels of training and professional experience, resilience and social support were necessary to health care workers who are first taking part in public health emergence.

1. Introduction

Corona Virus Disease 2019 (COVID-19) originated in Wuhan has spread throughout China from December 2019, which has seriously threatened human health (Huang et al., 2020). On 30th January, WHO announced the novel coronavirus pneumonia (NCP, later renamed as COVID-19) epidemic as Public Health Emergency of International Concern (WHO, 2020). According to the statistics of the National Health Commission of the People's Republic of China, 81,054 confirmed cases, 687,680 suspected cases and 3261 deaths had been reported in Chinese mainland up to 24:00 on March 21 (NHCPRC, 2020). The outbreak of COVID-19 as a major health care event has exerted a negative impact on daily life, threatened people's health both mentally and physically, and endangered social and economic development (Ma et al., 2020). In the face of such a severe situation, the government and the health department have issued various prevention and control policies, and actively taken various prevention and control measures to contain the epidemic. Since COVID-19 is the largest public health emergency in China in the past ten years, many young health care workers take active part in battling the COVID-19 epidemic. Different from the experienced ones who have ever joined the Public Health Emergency such as SARS, H1N1, the fresh health care workers at

around 30 years old are confronted with the much more occupational stress, which is also a big challenge to their resilience and mental health.

Resilience is an individual's capacity to deal with significant adversity and quick recover (Fletcher and Sarkar, 2013). Previous study showed that psychological resilience can protect individuals against mental illness and thrive from the adversity (Perlman et al., 2017; Hu et al., 2015a, b). Thus, it might help predict the workers' mental health by assessing their resilience.

Social support is individuals' perception or experience in terms of being involved in a social group where people mutually support each other (Cao et al., 2018). Family, friends or any other important relatives could provide material and spiritual support, which probe to be positively associated with mental health (Rothman et al., 2012). Due to highly contagious COVID-19, the health care workers have to cut off the direct contact with other people, and spend time alone after work. Therefore, the availability of social support might be of importance to medical team.

This research is to investigate the mental health among the health care workers battling the COVID-19 and to explore the associations among social support, resilience and mental health.

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2. Methodology

A total of 1521 health care workers were recruited in this study. They all took part in battling the COVID-19 epidemic in Jiangsu Province. Among them, 147 people had public health emergency experience before (experienced staff), while 1374 people had no experience (fresh staff). All participants completed the Symptom Check-List-90 (SCL-90), Chinese version of Connor-Davidson resilience scale (CD-RISC) and Social Support Rating Scale (SSRS).

The SCL-90, designed by Derogatis and his colleagues (Derogatis et al., 1973), is a questionnaire to assess self-reported symptom intensity including a number of different subscales. The 90-item scale consists of 10 factors including somatization, obsessive—compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychotieism, and additional items. Responses to items are measured on a 5-point Likert scale ranging from 0 (none) to 4 (severe). Items are added and converted to obtain the subscale scores and total score. If any subscale score is higher than 2, positive items are higher than 43, or the total score is higher than 160, it suggests psychological abnormality. The SCL-90 has been widely used in previous studies with high reliability and validity (Crespo-Maraver et al., 2018; Holi et al., 1998; Wei et al., 2018). It exhibited strong internal consistency (Cronbach's $\alpha = 0.983$) in the current sample.

We evaluated resilience using the CD-RISC, which was first developed by Connor and Davidson (Connor and Davidson, 2003), and was later revised into Chinese version evolved by Yu and her colleagues (Yu et al., 2007). The 25-item scale contains three conceptually distinct subscales: strength (e.g., Coping with stress strengthens), tenacity (e.g., When things look hopeless, I don't give up) and optimism (e.g., See the humorous side of things). Responses to items are measured on 5-point Likert scale ranging from 0 (not true at all) to 4 (true nearly all the time). Items are added to obtain scores between 0 to 100, with higher scores denoting great resilience. The Chinese version of CD-RISC has shown good reliability and validity (Cai et al., 2017), and it also exhibited strong internal consistency (Cronbach's $\alpha = 0.954$) in the current sample.

The SSRS, designed by Xiao (1999), is a multidimensional self-report scale assessing social support. The 10 items comprise 3 factors: objective support (e.g., what's the sources of financial support and help to solve practical problems when you were in an emergency situation), subjective support (e.g., How many close friends do you have to get support and help), and availability (e.g., How to ask for help in case of trouble). Item scores are summed together to obtain the total score 0–50 with higher scores denoting stronger social support. The SSRS has been widely used in Chinese populations showing high reliability and validity (Liu et al., 2016), and it exhibited strong internal consistency (Cronbach's $\alpha = 0.949$) in the current sample.

This study was approved by the ethics committees of the Second Military Medical University. All participants received an informed consent before data collection, so that they could choose whether or not to participate, and withdraw at any time if they wished.

Frequencies, percentages and standard deviations were calculated for descriptive analysis. Demographic and occupation backgrounds of health care workers with and without psychological abnormality were compared using χ^2 test. The differences of mental health, resilience and social support between fresh staff and experienced staff were compared via simple independent sample *t*-test. And multiple regression analyses were used to examine the associations among resilience, social support and mental health in fresh staff and experienced staff. $P < 0.05$ was considered statistically significant. SPSS 22.0 (SPSS Inc, Chicago, IL) was used to conduct the analysis.

3. Results

The prevalence of psychological abnormality was 14.1%. As shown in Table 1, public health emergency treatment experience was

significantly associated with a decreased prevalence of psychological abnormality. Besides, there was a marginal significant association between the length of service and the prevalence of psychological abnormality. To address the cohort effect of age, we further compare prevalence of psychological abnormality between fresh group and experienced group in the over-30. 105 fresh staff and 9 experienced staff turned out to be positive. There was also a marginal significant association between public health emergency treatment experience and prevalence of psychological abnormality in over-30 populations ($\chi^2 = 3.471$, $p = 0.062$).

We further compared the mental health differences between experienced staff and fresh staff. As shown in Table 2, statistically significant differences in interpersonal sensitivity and phobic anxiety were noted between groups ($p < 0.05$). Besides, there was a marginal significant difference in obsessive-compulsive ($p < 0.10$) and no significant differences in other seven subscales.

Table 3 shows that fresh staff had significantly lower scores in CD-RISC total and three subscales than experienced staff ($p < 0.001$). In compared with experienced staff, fresh staff has presented a significantly lower level of resilience, and the significance held across the three aspects: tenacity, strength, optimism.

Table 4 shows that fresh staff had significantly less scores in objective support, subjective support and SSRS total scores than experienced staff ($p < 0.05$). Nevertheless, there was no significant difference in availability of support between groups.

Table 5 shows the result of multiple regression analysis predicting mental health by resilience and social support in fresh staff and experienced staff. Tenacity, strength, objective support, subjective support and availability of support could significantly predict the mental health in fresh staff. However, there is no factors significantly predicting mental health in experienced staff.

4. Discussion

Previous study showed that occurrence of psychiatric symptoms were linked to younger age and less family support (Su et al., 2007). The current study further revealed that people without public health emergency experience showed worse mental health, resilience and social support, and tended to get psychological abnormality on interpersonal sensitivity and phobic anxiety. Apart from working at the front line, they stayed at room alone without any face-to-face interpersonal communication. Lack of social support leads to much more depression and anxiety especially in high-risk working conditions (Plaisier et al., 2007). In order to prevent cross infection, the social distance between people had to be increased. When others had fevers or cough, people became more sensitive and tended to show some obsessive-compulsive symptoms such as washing hands repeatedly. The daily increasing numbers of confirmed cases and deaths also increase the level of anxiety and terror in the fresh staff. Nevertheless, majority of the experienced staff had taken part in previous public health emergence before, such as Severe Acute Respiratory Syndrome (SARS) and H1N1. They knew how to protect themselves better and had the confidence to overcome the disease compared with fresh staff, which was of benefit to enhance their resilience and mental health. Therefore, constructive peer-support (Banerjee, 2020), effective online mental health service (Yao et al., 2020) and early screening and interventions (Zandifar and Badrfam, 2020) were necessary to address mental health needs in health care workers.

Another intriguing finding from our study is that resilience (tenacity, strength) and social support (objective support, subjective support and availability of support) could significantly predict the mental health in fresh staff. Resilience is regarded as a protective factor to mental health (Hu et al., 2015a, b). The fresh staff with high strength and tenacity showed greater courage and would not quit in this medical battle. Certainly, good social support might also have buffered the average severity of symptom among people in high risk work (Chen

Table 1
Characterization and distribution of total and positive results.

Demographics		Total population (n)	Positive Population (n)	Prevalence of psychological abnormality (%)	χ^2	p
Gender	Male	372	46	12.3	1.271	0.260
	Female	1149	169	14.7		
Age group	18-30	662	101	15.2	1.232	0.540
	31-40	583	78	13.4		
	41 and over	276	36	13.0		
Education level	High school or lower	320	45	14.1	1.930	0.381
	Undergraduate	972	131	13.5		
	Postgraduate or higher	229	39	17.0		
Marital status	Married	1123	146	13.0	4.558	0.102
	Unmarried	380	66	17.4		
	Divorce or bereavement	18	3	16.7		
Offspring	none	516	82	15.9	3.422	0.181
	one	718	101	14.1		
	two or more	287	32	11.1		
Length of service	2 or less	158	19	12.0	8.347	0.080
	3-5	369	68	18.4		
	6-10	376	44	11.7		
	11-20	414	58	14.0		
	21 and more	204	26	12.7		
Medical staff	Yes	1198	174	14.5	0.702	0.402
	No	323	41	12.7		
Occupation	Doctor	511	36	17.1	2.672	0.750
	Nurse	546	72	13.2		
	Technician	45	7	15.6		
	Pharmacist	72	12	16.7		
	Logistical personnel	136	17	12.5		
	Social worker	511	71	13.9		
Public health emergency experience	Yes	147	12	8.2	4.782	0.029
	No	1374	203	14.8		

Table 2
Mental health of fresh staff and experienced staff.

	Fresh staff (n = 1374)	Experienced staff (n = 147)	t	p
Somatization	1.14 ± 0.31	1.12 ± 0.26	0.855	0.393
Obsessive-Compulsive	1.39 ± 0.45	1.33 ± 0.35	1.760	0.080
Interpersonal sensitivity	1.25 ± 0.40	1.20 ± 0.29	2.099	0.037
Depression	1.23 ± 0.40	1.20 ± 0.29	1.428	0.155
Anxiety	1.21 ± 0.35	1.16 ± 0.31	1.633	0.104
Hostility	1.22 ± 0.37	1.20 ± 0.29	0.493	0.622
Phobic anxiety	1.19 ± 0.37	1.13 ± 0.28	2.405	0.017
Paranoididefition	1.17 ± 0.33	1.17 ± 0.28	0.126	0.900
Psychotieism	1.15 ± 0.32	1.12 ± 0.27	1.159	0.248
Additionalitems	1.22 ± 0.36	1.21 ± 0.35	0.319	0.750

Table 3
Resilience of fresh staff and experienced staff.

	Fresh staff (n = 1374)	Experienced staff (n = 147)	t	p
Tenacity	34.32 ± 8.28	38.42 ± 7.59	5.743	<0.001
Strength	23.43 ± 4.94	25.88 ± 4.23	6.539	<0.001
Optimism	9.98 ± 2.68	11.06 ± 2.76	4.642	<0.001
CD-RISC	67.73 ± 14.85	75.36 ± 13.27	5.976	<0.001

Table 4
Social support of fresh staff and experienced staff.

	Fresh staff (n = 1374)	Experienced staff (n = 147)	t	p
Objective support	10.69 ± 3.80	11.56 ± 3.90	2.628	0.009
Subjective support	24.76 ± 5.01	25.84 ± 4.34	2.818	0.005
Availability	8.31 ± 2.01	8.30 ± 2.01	-0.078	0.983
SSRS	43.76 ± 8.69	45.7 ± 7.69	2.861	0.005

Table 5
Multiple regression analysis predicting mental health by resilience and social support in fresh staff and experienced staff.

items	beta	SE	95%CI	t	p
Experienced staff					
Tenacity	-0.265	0.447	-1.726 - 0.042	-1.882	0.062
Strength	-0.045	0.874	-1.983 - 1.472	-0.292	0.771
Optimism	-0.016	0.910	-1.94 - 1.659	-0.155	0.877
Objective support	-0.078	0.520	-1.51 - 0.547	-0.926	0.356
Subjective support	-0.081	0.491	-1.424 - 0.519	-0.921	0.358
Availability	-0.068	1.006	-2.805 - 1.175	-0.810	0.420
Fresh staff					
Tenacity	-0.125	0.187	-0.822 - 0.088	-2.430	0.015
Strength	-0.110	0.323	-1.306 - 0.038	-2.078	0.038
Optimism	-0.046	0.402	-1.309 - 0.267	-1.297	0.195
Objective support	-0.073	0.229	-1.029 - 0.13	-2.530	0.012
Subjective support	-0.092	0.179	-0.906 - 0.203	-3.095	0.002
Availability of support	-0.114	0.426	-2.531 - 0.861	-3.982	<0.001

et al., 2005; Dyregrov et al., 1996). Therefore, it is important to have a high level of training and professional experience in health care workers engaging in public health emergence, especially for the fresh staff.

Several limitations in current study need to be mentioned. One is that we lack of investigation on fatigue status and sleep quality of health care workers. The usual rhythm of work and life was disrupted, which might lead to their insomnia and fatigue. On the other hand, the cross-sectional design failed to explain it thoroughly whether the weak resilience and less social support in fresh staff caused their much more psychological abnormality. Since the public health emergence has a long-term effect on health care workers' anxiety, depression and sleep quality (Chen et al., 2006), the following researches are suggested to adopt a within-design study to evaluate the mental health and potential

factors of health care workers during the public health treatment.

5. Conclusions

On the basis of our findings, health care workers without public health emergency experience showed worse performance in mental health, resilience and social support, and tended to get psychological abnormality on interpersonal sensitivity and phobic anxiety. A high level of training and professional experience, resilience and social support were necessary for health care workers who are first taking part in public health emergence.

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Declaration of Competing Interest

No conflict of interest exists in the submission of this manuscript.

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