The Sub-health Status of Different Social Roles and the Analysis of its Influencing Factors during the 2019 Coronavirus Disease Pandemic

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ABSTRACT

Aim: This paper aims at investigating the sub-health status (SHS) of different social roles during the 2019 coronavirus disease (COVID-19) pandemic and analyzing its influencing factors. **Design:** A cross-sectional, convenience sampling including 1062 Chinese was conducted in March 2020. Statistical analysis was then performed for the data using SPSS 22.0. **Results:** The total SHS score for people with different social roles during the COVID-19 pandemic was 72.808±12.034; with the physical, psychological and social adaptive score were 80.252±12.336, 68.753±13.281 and 66.632±18.604 respectively. Univariate analysis showed that SHS scores for social adaptability were different in different places of residence, as well as physical, psychological and total SHS scores for different social roles ($P < 0.05$). The multivariate analysis showed that the social roles were a factor influencing the physical SHS score ($P < 0.05$), while gender was the factor influencing the psychological SHS score ($P < 0.05$). **Conclusion:** Human resource management needs improvement; meanwhile health consultation, enough time to rest and health care service are essential for medical staff, Centers for Disease Control (CDC) personnel, as well as couriers. Support to maintain work-family balance is seriously expected for female employees. Overall, the top priority in controlling COVID-19 is to protect their health both mentally and physically.

Key words: The coronavirus disease, Different social roles, Sub-health status, Influencing factors.

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INTRODUCTION

All age groups are susceptible to pneumonia caused by the severe acute respiratory syndrome coronavirus 2(SARS-CoV-2) novel coronavirus, known as the coronavirus disease 2019 (COVID-19) and infected cases are mainly associated with the symptoms of viral pneumonia.[1] During the COVID-19 pandemic, the Chinese government has imposed control measures with a temporary shutdown of some service-oriented businesses to reduce the presence of clusters and thus lower the risk of virus transmission. To ensure the essential operations of the society and necessities of living, pandemic preventing staff in many industries have to provide public servicesat risk of exposure to the virus, for example in hospitals, CDC, public transportation, express industry and community service center. They must perform the functions of their social roles out of work responsibility and social responsibility which is the process of fulfilling social roles.[2] Working under an unexpected threat from the virus, their health status can be inevitably impacted at physical, mental and social levels to some extent, thus concern over the health status of these groups is urgently needed.[3]

Sub-health status (SHS) is considered as a state between good health and illness characterized by some clinical manifestations that cannot be diagnosed with any disease of clinical standards. It is also recognized as somatoform disorders and medically unexplained symptoms.[4] While SHS can develop into a disease, people suffering from it may also fully recover. Furthermore, effective interventions can certainly help to facilitate recovery.[5] According to a global survey by WHO, only 5% of the world's population is truly healthy, diseases are identified in only 20% and the remaining 75% are suffering from SHS.[6] Multiple studies in China have shown that the prevalence of SHS in the general population ranges from 36.23% to 68.4% and various possible symptoms and risk factors associated with SHS have been investigated and discussed.[7-13] However, no related literature has reported the correlation regarding the sub-health status of people playing their different parts in the disease prevention and control under a massive pandemic. A concern is there by raised that SHS may lead to higher morbidity or cause greater health consequences due to the impact of apandemic.

As such, a questionnaire-based study was conducted to investigate the status quo of sub-health during the fight against COVID-19 among the people with different social roles, to provide a theoretical basis for

the health sector in the development of healthcare interventions. Given that COVID-19 cases have been reported in many countries across the world with varying prevalence,[14] this study may also serve as a report from which the pandemic prevention staff in other countries or regions may learn from to proactively respond to the spread of COVID-19.

MATERIALS AND METHODS

Subjects

Convenience sampling was used to select the COVID-19 pandemic preventing staff as the study subjects. Inclusion criteria: 1) subjects who provided informed consents and volunteered to participate in this investigation; 2) people working during the pandemic in China, including medical staff, CDC personnel, scientific researchers, government officials, community service workers, public transport employees, police, couriers, volunteers, as well as staff in other positions. This study has been approved by the medical ethics committee of the first affiliated hospital of Jinan University (approval number: KY-2020-016).

Research Methods
Research Tools
General information questionnaire

Survey form for general information was designed by the investigator and consisted of 17 survey items, including Gender, age, height, weight, nationality, place of origin, current residence, family residence, education, marital status, only child, political status, occupation, social role, monthly salary, virus exposure history and family infection history.

SHS questionnaire of Chinese residents during COVID - 19 pandemic

This questionnaire was designed based on the sub-health rating scale (SHMSV1.0) developed by Xu Jun.[13] This modified scale would contain three dimensions making up 3 subscales, namely physical sub-health (1-14 items), psychological sub-health (16-27 items) and social adaptive sub-health (29-37 items) with a total of 39 items. The items 15, 28, 38 and 39 were used for the overall evaluation of the health status within each dimension and would not be taken into account for the score rating. A commonly used 5-point Likert scale was developed to incorporate the positive items, including questions 1-3, 13-19 and 26-39 with a scaled score equal to the raw score at 1-5; while negative items including questions 4-12 and 20-25 with a scaled score equal to 6 min the raw score. For each subscale, the sum of all item scores was the raw score. The total raw score was calculated as the sum of raw scores derived from all 3 sub-scales. For any individual dimension, a lower score indicated higher severity of SHS. For sub-scales and the whole scale, raw scores were converted into percentile scores for statistical analysis. Converted score = (raw score - minimum theoretical score) / (maximum theoretical score − minimum theoretical score) × 100. The highest and lowest converted scores of the three subscales were 0 and 100 respectively. In this study, analysis of sub-health was performed using converted scores for all subscales and the whole scale. Based on the sub-health rating scale developed by Xu Jun, the health condition of subjects would be assessed as disease status (scored < 54), SHS (scored 54 to 79) and health status (scored > 79).[13] This questionnaire exhibited a content validity index Kaiser-Meyer-Olkin (KMO) of 0.859 and a Cronbach's α coefficient of 0.912, indicating good reliability and validity.

Data Collection

Data were collected throughWenjuanxing (wjx.cn; an online platform available for questionnaire sources) from March 6 to 9, 2020 and all the information should be completed before a questionnaire could be submitted. To ensure the acceptance of those questionnaires, 1) invalid questionnaires which were completed in less than 2 min, as well as where the same answers were found for all options should be excluded from the study; 2) only the first round of answers submitted were considered valid by screening per IP addresses and time of response to prevent multiple questionnaires exported from one single machine; 3) staff who were not working or were preparing to participate in the battle against COVID-19. A total of 1088 questionnaires were dispensed and 1088 were collected. By excluding the 18 questionnaires that were completed in less than 2 min and the 8 questionnaires completed improperly, 1062 eligible questionnaires were eventually acquired, showing an effective recovery rate of 97.6%.

Data Analysis

Data analysis was performed using SPSS22.0. Descriptive statistics included frequency, proportion and mean ± SD. The comparison of general data between groups was performed by *t*-test and the comparison between multiple groups was performed by One-way analysis of variance ANOVA. Multiple linear regression was used to analyze the influencing factors among gender, political status, residence and social roles, using a two-sided test at $\alpha= 0.05$ $P < 0.05$ was considered statistically significant.

RESULTS

General Demographic Characteristics

In this study, a total of 1062 pandemic preventing staff fighting the COVID-19 were investigated, including 572 males (53.9%) and aged 17 to 67 years with a mean age of (24.929 ± 9.009) years. The rest of the general information is shown in Table 1.

Health Condition of People with Different Social Roles during the COVID-19 Pandemic

Of the 1062 staff against COVID-19 included in this study, 61 were assessed to have disease status (5.7%), 659 SHS (62.1%) and 342 health status (32.2%). The subjects who were assessed to have SHS in different social roles, including couriers, volunteers, medical staff, staff in other positions, community service workers and public transport employees accounted for 66.6%, 63.37%, 63.16%, 63.02%, 57.53% and 52.94%. By place of residence, 62.9% of urban residents and 61.7% of rural residents were assessed to have social adaptive SHS.

In this study, the total sub-health score for the pandemic preventing staff was 78.808±12.034，with a mean score of 2.080±0.344 based on all items. Among the three subscales, the highest score 80.252±12.336 was noted in physical sub-health status, followed by 68.753±13.281 for psychological sub-health status and 66.632±18.604 for social adaptive sub-health status. (Table 1). Sequentially, lower physical sub-health status scores were observed as 64.120±12.247 for couriers, 67.142±13.627 for CDC personnel and 70.031±12.731 for medical staff among the various social roles.

Univariate Analysis of SHS and General Information for People with Different Social Roles during the COVID-19 Pandemic

Based on the univariate analysis, significant differences can be found in the physical sub-health status scores for pandemic preventing staff holding a diverse range of social roles (*P*< 0.05); differences were also observed in psychological sub-health status scores as it pertains to gender, social roles (*P*< 0.05). Moreover, differences were again observed in social adaptive sub-health status scores by place of residence (*P*<0.05);

Table 1: Univariate Analysis of Sub-health Status and General Information of Pandemic Preventing Staff.

Item		N(%)	Physical Sub-health Score			Psychological Sub-health Score			Social Adaptive Sub-health Score			Total Sub-health Score		
			Score	Statistics	P value	Score	Statistics	P value	Score	Statistics	P value	Score	Statistics	P value
Gender	Male	572（53.9）	81.063±12.673	2.316	0.210	69.664±14.026	2.419	0.016	65.657±20.269	-1.849	0.065	73.193±12.911	1.126	0.261
	Female	490（46.1）	79.308±11.875			67.691±12.285			67.772±16.396			72.359±10.942		
Age	<20years	171（16.1）	78.697±13.432	1.204	0.307	68.957±13.828	0.164	0.956	68.616±18.996	1.505	0.199	72.765±12.889	0.288	0.886
	20~25years	652（61.4）	80.574±12.125			68.663±13.288			65.704±18.934			72.667±12.030		
	25-30years	56（5.3）	79.209±13.520			68.415±13.994			65.675±21.862			72.028±13.874		
	30-40years	79（7.4）	81.804±11.896			68.196±12.521			67.089±16.093			73.354±10.325		
	≧40years	104（9.8）	80.185±11.899			69.591±12.696			69.364±15.241			73.770±10.962		
Residence	Rural	609（57.3）	80.714±12.672	0.383	0.157	68.650±13.398	0.098	0.769	65.152±18.814	0.139	0.003	72.576±12.387	1.790	0.468
	Urban	453（42.7）	79.631±11.854			68.892±13.136			68.622±18.148			73.118±11.572		
Only Child	YES	235（22.1）	80.410±12.966	0.222	0.825	69.823±14.770	1.399	0.162	68.629±19.637	1.866	0.062	73.751±12.994	1.360	0.174
	NO	827（77.9）	80.208±12.159			68.450±12.821			66.065±18.273			72.540±11.755		
Marital Status	Unmarried	888（83.6）	80.249±12.196	1.697	0.184	68.834±13.028	0.462	0.630	66.232±18.934	1.588	0.205	72.731±11.951	1.089	0.337
	Married	149(14)	80.980±11.546			68.694±13.196			69.146±15.101			73.724±10.767		
	Other situations	25(2.4)	76.071±19.670			66.250±21.101			65.889±24.487			70.086±20.139		
Education	Junior high school	60(5.7)	82.234±16.243	1.166	0.324	70.764±16.355	1.783	0.130	63.935±24.240	0.559	0.692	73.512±15.808	1.060	0.375
	Senior high school	61(5.7)	81.996±11.262			71.072±12.136			68.670±14.917			74.824±10.569		
	Junior college	906(85.3)	80.111±12.090			68.584±12.934			66.722±18.328			72.716±11.747		
	Bachelor's degree	24(2.3)	79.092±9.942			67.708±11.721			65.972±17.554			71.815±10.250		
	Master's degree	11（1.0）	75.162±17.377			61.174±25.959			64.141±27.116			67.532±21.317		
Social roles	Medical staff	114（10.7）	76.331±13.696	3.164	0.001	65.606±13.353	2.269	0.016	66.130±20.341	1.616	0.106	70.031±12.731	2.333	0.013
	CDC	3（0.3）	75.595±11.889			59.722±12.729			63.888±21.695			67.142±13.627		
	Researchers	6（0.6）	82.440±16.382			78.819±10.575			71.296±31.114			78.333±15.270		
	Government official	12（1.1）	80.208±16.382			72.569±11.978			69.212±14.838			74.761±09.219		
	Community service	73（6.9）	81.115±11.900			70.234±14.535			69.254±19.157			74.334±12.544		
	Public transport	17（1.6）	77.836±12.243			72.671±11.455			71.895±18.964			74.537±12.063		
	Police	6（0.6）	90.476±12.508			72.222±18.193			74.074±14.344			80.000±13.960		
	Couriers	13（1.2）	70.192±13.069			61.217±13.245			58.547±25.216			64.120±12.247		
	Volunteers	415（39.1）	80.744±11.335			69.377±12.376			68.105±17.299			73.597±11.037		
	Other positions	403（37.9）	80.977±12.671			68.563±13.794			64.586±18.838			72.506±12.542		
Monthly Salary	< RMB 5k	467（44.0）	80.479±12.277	0.469	0.704	69.164±13.319	0.906	0.437	67.362±18.645	2.141	0.093	73.227±11.824	0.690	0.558
	RMB 5-10k	122（11.5）	79.420±12.085			69.586±12.155			69.216±15.132			73.425±10.988		
	RMB 10-15k	35（3.3）	78.571±09.635			66.250±12.385			67.777±14.809			71.571±09.497		
	> RMB 15k	438（41.2）	80.377±12.672			68.283±13.607			65.043±19.597			72.288±12.725		

for total sub-health scores, there were differences across social roles (*P*<0.05). (Table 2)

Multivariate Analysis of Sub-health Status of People with Different Social Roles during the COVID-19 Pandemic

A multivariate analysis (α_{entry} = 0.05, $\alpha_{removal}$ = 0.1) was performed with physical sub-health status scores, psychological sub-health status scores, social adaptive sub-health status scores and total sub-health scores as dependent variables, whereas statistically significant variables from the univariate analysis were taken as independent variables (Table 3). The results showed that both social roles were the influencing factors for the physical sub-health status score (*P*<0.05); gender was influencing factors for psychological sub-health status score (*P*<0.05); (Table 4)

DISCUSSION

Prevalence of SHS among People with Different Social Roles during the COVID-19 Pandemic

A total of 1062 pandemic prevention and control staff were included; results showed that 62.1% of this population had SHS, which was consistent with the study findings of Hu Xianming *et al.*[7] During the COVID-19 pandemic, the prevalence of SHS among pandemic preventing staff remained high, below the expectations for the general health condition. Among the three sub-health dimensions, the highest score was noted in physical sub-health status, followed by psychological sub-health status and social adaptive sub-health status. In the event of the COVID-19 pandemic, non-professionals may be worried about being infected with the virus due to a lack of medical knowledge, thereby resulting in a series of psychological stress reactions. Their psychological sub-health was characterized by a group of changes in terms of emotion, cognition and behaviors, including fear, anxiety, helplessness, frustration, etc;[15] social adaptive sub-health manifested itself as inadaptability to the environment, troubled interpersonal relationships and dysfunctional roles.[16] Low social adaptive sub-health status scores may be related to tough control measures as well as the universal impact on daily lifestyles, interpersonal communication and social roles.[17]

Table 2: Descriptive Statistics for Sub-health Status of Pandemic Preventing Staff (*n*=1062).

Factor	Full Score	Number of Items	Score($x \pm s$)	Mean Score by Item
Physical Sub-health	70	14	80.252±12.336	5.732±0.881
Psychological Sub-health	60	12	68.753±13.281	5.729±1.106
Social adaptive Sub-health	45	9	66.632±18.604	7.403±2.067
Total Score	175	35	72.808±12.034	2.080±0.344

Table 3: Assignment of Independent Variables.

Independent Variable	Value Assignment
Gender	Male = 1; female = 2;
Social roles	Medical staff = 1; CDC = 2; scientific researchers = 3; Government officials = 4; community service workers = 5; public transport personnel = 6; police = 7; couriers = 8; volunteers = 9; staff in other positions = 10;

Therefore, during the COVID-19 pandemic, they need more psychological care and material support. Psychological support facilities are expected to provide them with psychological services such as psychological counseling and psychological intervention. Only the assurance of good health can guarantee them to perform well at work,[18] thus ensuring proper implementation of COVID-19 prevention and control.

Relationship between Place of Residence and Social Adaptive SHS

This study demonstrated that statistically significant social adaptive sub-health status scores were observed in places of residence from the univariate analysis (*P*< 0.05), while the results of the multivariate analysis were not statistically significant (*P*> 0.05). However, the prevalence of social adaptive SHS was higher in urban areas than in rural areas. The reasons may include limited space of activities and lifestyle changes resulted from indoor isolation of people living in cities during the pandemic. In contrast, the living environment in rural areas is relatively comfortable and has less restriction, leaving few changes from the pre-pandemiclifestyle.[19] Dysfunctional roles developed as social adaptive sub-health. Due to the impact of the COVID-19 pandemic, many enterprises suspended production and even forced to shut down. Urban wage earners were unable to return to work as scheduled, which caused most people to develop the incapability to adapt due to the interruption of social function. On the contrary, rural residents found more freedom to arrange their work and acquired fewer influences on lifestyles, thereby causing no significant inadaptability.[16]

Relationship between Social Roles and Physiological Sub-health Status

This study showed that couriers, medical staff and CDC personnel had lower physical sub-health status scores, all of whom were at physiological SHS. About the reasons for low physical sub-health status scores for couriers, we speculated that couriers were responsible for delivering necessary supplies to people quarantined indoors in response to inconvenience caused by COVID-19. These employees continued working under heavy load and increased risk of exposure to COVID-19 without adequate rest when they had too much work stress to handle. Low physical sub-health status scores observed for CDC personnel and medical staff may be related to engagement during which they were responsible for epidemiological investigations, nucleic acid tests and detection of virus specimens. Furthermore, medical staff needed

Table 4: Multivariate Analysis of Sub-health Status of Pandemic Preventing Staff.

Variable	Bvalue	Standard Error	Bvalue	Tvalue	Pvalue
Physical Sub health Score					
Constant Item	76.935	1.088	—	70.721	<0.001
Social roles	0.375	0.115	0.099	3.251	0.001
Psychological Sub-health Score					
Constant Item	71.637	1.259	—	56.878	<0.001
Gender	-1.973	0.816	-0.074	-2.419	0.016

[1]R^2=0.010，调整R^2=0.009，*F*=10.569，*P*=0.001；[2] R^2=0.005，调整R^2=0.005，*F*=5.850, *P*=0.016

to carry out important tasks such as managing the infected cases, putting them at a greater risk of viral infection and under tremendous pressure, both physically and psychologically. It is reported that SHS can be prevented from progressing to disease by providing effective health guidance, healthcare interventions, protection knowledge and protective skills.[20] Therefore, we need to pay more attention to the physical and mental health of these groups of people by taking into consideration of health consultation, protection guidance, health examination and medical security; managers are recommended to adjust human resource allocation on time and to optimize human resource management,[21] allowing relevant staff to have adequate rests for recovery of physical and mental health, to avoid the progression into illness where possible. In this way, these staff will always be well prepared to provide their services as their physical and mental health is maintained.

Relationship between Genders and Psychological Sub-health Status

For psychological dimension, statistically, significant differences were found between men and women who were assessed as 69.664±14.026 and 67.691±12.285 respectively ($P = 0.016$), which meant women had slightly worse mental health status compared with men and both were in SHS. This result was consistent with the study findings of Yang Yang *et al.*[22,23] and Zhang Yingzhi *et al.*[22,23] However, this difference may be driven by the large sample size, which should be treated with caution. During the COVID-19 pandemic, frequent contacts with different groups of people in the society increased the risk of infection for the pandemic preventing staff, result in higher mental stress to them. Wang Xiu *et al.*[24] believed that SHS in women were mainly characterized by psychological aspects and that women were more likely to develop anxiety, tension, depression as well as other emotional disorders, resulting in psychological disorders since they tended to be emotional. Due to the COVID-19 pandemic, women were more prone to various psychological reactions such as anxiety and tension. Shi Ling *et al.*[25] believed that these abnormal psychological reactions would further affect their physiological function, coupled with different individual constitutions, work environment, family conditions, social environment and some stressful life events, all of which may lead to adverse effects on physical and mental health in women. In addition, prolonged duration of work, increased stress and higher work intensity during the pandemic had also broken the work-family balance;[26] women typically served more than one role by working and taking care of their family with inadequate time for self-regulation. The emotional support given by family members has been shown to help resolve the work-family conflict,[27] thus family support and understanding are very important. As indicated by this questionnaire survey, women had lower psychological sub-health status scores, for which management staff is recommended to take various measures to provide women with more emotional care and psychological support. Also, additional support is encouraged with regard to female staff, including material supplies to their families, assistance in learning for their children and other necessary support for their daily life. These will serve as a strong conviction for women to throw themselves into the battlegrounds free of family concerns and to help recover from their SHS.

Limitations of the Study

First, although much effort has been spent to mobilize a variety of occupational groups to participate in this survey, biased occupational distribution still existed in the population. Second, there was also an age bias for the study population between 18 to 40 age group young adults and a small number of people aged over 50 years, which may be related to the rare use of electronic products by the elderly. Third, the data sources of this study were mostly limited to Guangdong Province, China, which brought regional limitations to the study findings along with the publication bias. This survey is expected to cover other regions or populations for further validation in the future.

CONCLUSION

Currently, COVID-19 has been declared as a pandemic and the "draconic" measures taken by China for disease control have been proven effective. However, travel bans make a significant impact on the daily lives of people. Employees from some industries must continue working and provide services to maintain the essential operations of the society. In these individuals, the prevalence of SHS is high due to heavier workload and increased risk of virus exposure. Among them, the medical staff, CDC personnel and couriers need assistance in maintaining their physical health. It is recommended that managers make prompt decisions to optimize human resources management as well as providing health consultations, adequate rests and medical security. Since women need more mental health support, goods and necessary supports for a daily living may be provided to maintain their work-family balance. These ordinary workers play an important part in COVID-19 prevention and control in China. Only by maintaining the good health of those fighting against COVID-19 can we stop the spread of the virus more effectively.

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CONFLICT OF INTEREST

The authors have no conflicting interest.

ABBREVIATIONS

COVID-19: The Coronavirus Disease 2019; **SHS:** The Sub-Health Status; **WHO:** World Health Organization; **CDC:** Center for disease control and prevention.

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