·新冠肺炎专栏·

DOI:10.16605/j.cnki.1007-7847.2020.04.002

人群对新型冠状病毒的预防情况及心理压力水平分析

张雪妍[a,b], 廖振欣[a,c], 袁 帅[a,b], 蒋伯岳[a,b], 黄浩杰[a,b], 赵明一[a*]
(中南大学 a. 湘雅三医院 儿科; b. 湘雅医学院; c. 湘雅公共卫生学院, 中国湖南 长沙 410013)

摘 要: 严重急性呼吸综合征冠状病毒 2 (severe acute respiratory syndrome coronavirus 2, SARS-CoV-2)是一种从肺炎患者气道上皮细胞中分离得到的新型冠状病毒。2019 年 12 月底, 新冠肺炎疫情开始出现, 并逐渐在全球范围内蔓延。目前, 全球确诊病例和死亡病例已分别超过 1 112 万和 52 万。尽管人们已经对这种新型冠状病毒采取了预防措施, 但 SARS-CoV-2 及其导致的新冠肺炎仍然造成了压力和恐慌。本文通过向社会各阶层、各地区人群随机发放匿名调查问卷的方式, 评估了受试人群对 SARS-CoV-2 的认知、预防措施和压力水平。经过筛选后本次调查一共收集到了 710 份有效样本。数据分析结果显示: 人群大多采取了有效的预防措施; 医务人员、医学生、非医学生和其他工作人员对病毒的认识程度不同, 从而压力水平也不同。武汉地区的居民比其他地区的居民压力更大; 实施了有效的预防措施、有良好认知的人员, 特别是医务人员, 其压力水平较低。本研究旨在分析人群针对 SARS-CoV-2 采取预防措施的有效性以及新冠肺炎疫情造成的人群心理压力水平, 借此探讨在疾病治疗、媒体报道和政府措施等各个方面的相关防疫举措, 力求缓解 SARS-CoV-2 对人群造成的心理压力。

关键词: 严重急性呼吸综合征冠状病毒 2 (SARS-CoV-2); 2019 冠状病毒病(COVID-19); 心理压力; 疾病认知; 疾病预防

中图分类号: R395, R749.4, R749.72 **文献标识码**: A **文章编号**: 1007-7847(2020)04-0263-08

An Analysis of Precautionary Actions Against SARS-CoV-2 and Psychological Stress Levels of Different Populations in China

ZHANG Xue-yan[a,b], LIAO Zhen-xin[a,c], YUAN Shuai[a,b], JIANG Bo-yue[a,b], HUANG Hao-jie[a,b], ZHAO Ming-yi[a*]
(a. *Department of Pediatrics, the Third Xiangya Hospital*; b. *Xiangya School of Medicine*; c. *Xiangya School of Public Health, Central South University, Changsha* 410013, *Hunan, China*)

Abstract: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a novel coronavirus isolated from airway epithelial cells in patients with pneumonia. At the end of December 2019, the coronavirus disease 2019 (COVID-19) epidemic began in Wuhan, China, and gradually spread all over the world. There have now been more than 11 125 000 confirmed cases and 528 000 deaths worldwide. Although people took preventative measures against this virus, both the virus and the epidemic still caused great stress and panic. A random sample survey with an anonymous questionnaire was used and 710 valid samples were collected.

收稿日期: 2020-03-17; **修回日期**: 2020-07-06
基金项目: 长沙市科技计划项目(新冠肺炎专项) (kq2001044)
作者简介: 张雪妍(1999—), 女, 江苏苏州人, 学生; 张雪妍和廖振欣对本文的贡献相同, 为本文共同第一作者; * 通信作者: 赵明一(1983—), 女, 河北廊坊人, 助理研究员, 硕士生导师, 主要从事儿科学相关工作及研究, E-mail: 36163773@qq.com。
Received date: 2020-03-17; **Accepted date:** 2020-07-06
Foundation items: Changsha Science and Technology Plan Project (kq2001044)
Biographies: ZHANG Xue-yan (1999-), female, born in Suzhou, Jiangsu Province, undergraduate. ZHANG Xue-yan and LIAO Zhen-xin made the same contribution to this paper. * Corresponding author: ZHAO Ming-yi (1983-), female, born in Langfang, Hebei Province, research assistant, Master's degree supervisor, mainly engaged in pediatrics related work and research, E-mail: 36163773@qq.com.

Knowledge about the virus, preventive measures and stress levels were assessed in this survey. The results showed that people generally had effective precautions during the epidemic. Medical staff, medical students, nonmedical students, and other workers had different awareness levels about the virus, and their stress levels also varied. People in Wuhan had higher levels of stress than those in other regions. People who implemented effective preventive measures and had a good understanding of SARS-CoV-2, especially medical staff, had lower stress levels. This study aims to analyze the effectiveness of preventive measures against SARS-CoV-2 and the psychological stress levels of populations, and to further explore the response measures in various aspects such as disease treatment, media coverage and government measures, so as to help alleviate the psychological stress brought by the novel coronavirus.

Key words: severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); coronavirus disease 2019 (COVID-19); psychological stress; disease cognition; disease precaution

CLC number: R395, R749.4, R749.72 **Document code:** A **Article ID:** 1007-7847(2020)04-0263-08

(*Life Science Research*, 2020, 24(4): 263~270)

Since December 2019, a string of unexplained pneumonia cases have emerged in Wuhan, China and received global attention. On January 12, 2020, the World Health Organization (WHO) named this new virus as the 2019 novel coronavirus (2019-nCoV), which was later changed to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by International Committee on Taxonomy of Viruses (ICTV). On February 11, 2020, the WHO named the disease caused by the SARS-CoV-2 as coronavirus disease 2019 (COVID-19)[1]. The National Health Commission of China took prevention and control measures for Class A infectious diseases. The United Kingdom (UK) government invested £20 000 000 to help develop a SARS-CoV-2-specific vaccine. In addition, the United States (US) has suspended entry of immigrants and non-immigrants who once travelled to high-risk zones to halt further virus spread[2]. According to the WHO COVID-19 situation report, by July 5, 2020, there have been more than 11 million diagnosed cases all over the world, and over 528 thousand people died from the virus[3].

SARS-CoV-2 is the seventh newly discovered coronavirus that can infect humans. By constructing a phylogenetic tree, scientists found that SARS-CoV-2 was homologous to bat SARS-like coronavirus[4]. Structural analysis revealed mutations in viral spike and nucleocapsid proteins, which resulted in SARS-CoV-2 being less pathogenic than the SARS-CoV[5]. Patients infected with the virus developed fever, malaise, dry cough, leukopenia, lymphopenia, and CT ground-glass opacities of the lungs, while there were few obvious symptoms of the upper respiratory tract and digestive tract infections. SARS-CoV-2 appears to be generally milder than SARS-CoV in terms of severity, mortality, and transmissibility, so the patient's vital signs are stable in most cases[6~8]. Patients with chronic diseases (e.g., diabetes) are prone to developing severe diseases including acute respiratory distress syndrome (ARDS), requiring ICU admission and oxygen therapy, with a high mortality rate 2 days after hospitalization for ARDS. The incubation period of the virus is between 2 and 14 days. Human-to-human transmission mainly occurs via droplets or direct contact[9]. Currently, no vaccine or antiviral drug exists to cope with COVID-19. After further study, drugs such as lopinavir, ritonavir, and nucleoside analogues may be included in the treatment regimen[10].

Understanding the public knowledge of the virus enables the public sector to predict public behavior, which is crucial for assessing clinical readiness for a highly pathogenic viral pandemic[11~12]. A survey showed that medical staff were a high-risk infection group during the MERS (Middle East respiratory syndrome) and SARS outbreaks[13]. Medical students, especially preclinical-year medical students, also had a high risk of getting infection[14]. The high risk of infection would make healthcare workers anxious, which may be harmful to the physician's

personal health, as well as his or her real-time decision-making abilities during patient care[15~16].

To know about public knowledge of SARS-CoV-2 as well as its impact on different citizens' behavioral and psychological status, and to offer useful suggestions and measures, questionnaires related to knowledge, behavior and anxiety were designed to investigate the situation of the public, medical students, and medical staff from different regions and with different ages.

1 Methods

1.1 Participants

During the most serious outbreak period of SARS-CoV-2 in China in February, we designed the questionnaire to assess people's knowledge and stress level on COVID-19. Each participant filled out the same questionnaire, which included the public's general knowledge of SARS-CoV-2, measures taken to avoid the virus, and psychological stress levels. A stratified cluster method was used to randomly select survey participants. Online questionnaires were released and distributed to people of different ages, educational backgrounds, districts and industries. We also invited respondents to share the questionnaire with others to select more samples. All respondents were well informed and voluntarily participated in the survey[17].

1.2 Research contents

The questionnaire included basic knowledge of the new coronavirus pneumonia, protective measures and the psychological stress of the population during the public health emergency. We designed seven measures for the prevention of novel coronavirus infections to examine participants' basic behaviors and attitudes during the outbreak. Statistical methods were used to compare the differences in prevention measures among different populations. In addition, the knowledge of the new coronavirus among the population was calculated by using 12 judgment questions. Participants chose "True", "False" or "Uncertain" based on their knowledge. One point was awarded for each correct answer, and no point for a wrong or uncertain answer. The total score was 12. Statistical methods were used to calculate the scores and differences in knowledge of the new coronavirus of different populations. Finally, according to the stress system research model[18], to evaluate the corresponding physical and mental symptoms and degrees of individual psychological stress response, we created 20 statements with reference to Self-rating Depression Scale (SDS) and Self-rating Anxiety Scale (SAS), etc. Participants responded to these statements as "Strongly agree", "Agree", "Neutral", "Disagree" or "Strongly disagree". A Likert scale[19] was used, with "5" indicating "Strongly agree" and "1" indicating "Strongly disagree". Each subject was evaluated for behavioral, emotional and physical responses, and the total stress score was calculated. The maximum score was 100.

1.3 Analysis methods

The subjects completed questionnaires without providing their names. We summarized the results, entered the data in Excel, and conducted statistical analysis with SPSS 18.0 for Windows. Quantitative variables were expressed as the mean values with standard deviations. Qualitative variables were expressed in numbers and percentages. Chi-square tests and variance tests were used to compare the specific differences between people with different social roles. A P value less than or equal to 0.05 was considered statistically significant.

2 Results

2.1 Overall characteristics of respondents

A total of 710 valid respondents were included in this study (295 for men and 415 for women). The majority of participants were aged between 18 and 24 (49.44%) and between 25 and 39 (33.10%). Most of them had a bachelor's degree or above (45.49%) or were university students (40.14%). All the respondents were further divided according to their social status as follows: 130 medical workers (18.31%), 108 medical students (15.21%), 209 nonmedical students (29.44%) and 263 other workers (37.04%). All of the participants were Chinese citizens. The baseline information of the participants is shown in

Table 1.

2.2 Behavioral measures taken against the novel coronavirus

According to the Chi-square test, there were three measures that showed significant differences between different groups. For the measure item "Wash hands frequently and avoid touching eyes, nose, and mouth when going outside", 99.23% of the 130 medical staff chose "Yes". The prevalence was significantly higher than that of college students or other professionals. A total of 93.85% of medical staff would use a tissue to cover their mouth and nose when sneezing or coughing. This figure was also significantly higher than that of the other three groups. Interestingly, for these two items, the prevalence of taking these measures was higher among other occupational groups than among col lege students (medical and nonmedical students), which suggests that we should raise the awareness of preventing disease transmission among college students in basic college courses. When there was a symptom of fever, regardless of whether the respondent was a medical professional, medical student, nonmedical student or other worker, our questionnaire data showed that willingness to go to hospital for treatment was relatively low. The highest ratio was among other workers (79.47%). The prevalence of taking preventive measures in different groups is shown in Table 2.

2.3 Knowledge of the novel coronavirus

The knowledge of SARS-CoV-2 among medical staff, medical students, nonmedical students and other workers showed significant differences. It can be seen from the analysis that the average score of the virus-related knowledge of medical personnel reached 11.08±1.38, while the score of other workers was the lowest, only 9.69±1.86. As for college students, the score of the knowledge of medical students (10.55±1.69) was higher than that of nonmedical students (9.79±1.55). After all, the students from medical colleges had benefited from multiple professional courses. The correct answer rates of the 12 questions and the scores of each group are listed in Table 3.

2.4 Stress levels towards the novel coronavirus

Table 4 shows the scores of the stress response related to COVID-19 in the four groups of people. Of all the groups, the nonmedical students had the highest total score (42.38±17.36), while medical staff had the lowest one (37.25±15.69). We divided the questionnaire into 3 dimensions, in which the emotional response score was ranked the highest in all four groups. A total of 28.45% reported "Strongly agree" to "You feel worried about COVID-19". Only 34.08% of the people were sure about "I am not scared of what is going on".

2.5 Comparison of stress levels between Hubei and other regions

Hubei residents had a much higher score (48.59±18.29) than other people (F=18.099, P<0.01). The rate of choosing "Strongly agree" was significantly high for the 5 questions. A total of 11.11%

Table 1 The baseline information of the study sample

Characteristics		Number (proportion, %)				Total (n=710)
		Medical staff (n=130)	Medical students (n=108)	Non-medical students (n=209)	Other occupations (n=263)	
Age group	<18	0 (0)	0 (0)	3 (1.44)	5 (1.90)	8 (1.13)
	18~24	16 (12.31)	102 (94.44)	200 (95.69)	33 (12.55)	351 (49.44)
	25~39	91 (70.00)	6 (5.56)	6 (2.87)	132 (50.19)	235 (33.10)
	40~59	23 (17.69)	0 (0)	0 (0)	92 (34.98)	115 (16.19)
	≥60	0 (0)	0 (0)	0 (0)	1 (0.38)	1 (0.14)
Educational background	Undergraduate	4 (3.08)	94 (87.04)	184 (88.04)	3 (1.14)	285 (40.14)
	Bachelor's degree or above	118 (90.77)	14 (12.96)	22 (10.53)	169 (64.26)	323 (45.49)
	High school or below	8 (6.15)	0 (0)	3 (1.44)	91 (34.60)	102 (14.37)
Gender	Male	29 (22.31)	49 (45.37)	102 (48.80)	115 (43.73)	295 (41.55)
	Female	101 (77.69)	59 (54.63)	107 (51.20)	148 (56.27)	415 (58.45)

Table 2　Prevalence of precautionary measures taken by different populations

Items about precautionary measures	Answers	Number (proportion, %)				Total (*n*=710)	χ^2	*P*
		Medical staff (*n*=130)	Medical students (*n*=108)	Non-medical students (*n*=209)	Other workers (*n*=263)			
Give up unnecessary outdoor activities	Yes	129 (99.23)	106 (98.15)	205 (98.09)	257 (97.72)	697 (98.17)	1.12	0.772
	No	1 (0.77)	2 (1.85)	4 (1.91)	6 (2.28)	13 (1.83)		
Wash hands frequently and avoid touching eyes, nose and mouth when going outside	Yes	129 (99.23)	94 (87.04)	185 (88.52)	253 (96.20)	661 (93.10)	24.55	1.90E-5
	No	1 (0.77)	14 (12.96)	24 (11.48)	10 (3.80)	49 (6.90)		
Cover your nose and mouth with a tissue when coughing or sneezing	Yes	122 (93.85)	91 (84.26)	173 (82.78)	234 (88.97)	620 (87.32)	10.47	0.015
	No	8 (6.15)	17 (15.74)	36 (17.22)	29 (11.03)	90 (12.68)		
Cover your nose and mouth with a ask when going out	Yes	129 (99.23)	106 (98.15)	203 (97.13)	256 (97.34)	694 (97.75)	1.94	0.585
	No	1 (0.77)	2 (1.85)	6 (2.87)	7 (2.66)	16 (2.25)		
Pay attention to the increase in the number of daily cases	Yes	127 (97.69)	101 (93.52)	204 (97.61)	254 (96.58)	686 (96.62)	4.26	0.234
	No	3 (2.31)	7 (6.48)	5 (2.39)	9 (3.42)	24 (3.38)		
Avoid contact with others and isolate yourself when having a fever	Yes	128 (98.46)	107 (99.07)	209 (100.00)	261 (99.24)	705 (99.30)	2.86	0.413
	No	2 (1.54)	1 (0.93)	0 (0.00)	2 (0.76)	5 (0.70)		
Go to hospital immediately when there is a fever	Yes	103 (79.23)	68 (62.96)	164 (78.47)	209 (79.47)	544 (76.62)	13.33	0.004
	No	27 (20.77)	40 (37.04)	45 (21.53)	54 (20.53)	166 (23.38)		

Table 3　Cognition of SARS-CoV-2 among different populations

Yes/No statements about the virus	Answers	Number (proportion, %)				
		Medical staff (*n*=130)	Medical students (*n*=108)	Non-medical students (*n*=209)	Other workers (*n*=263)	Total (*n*=710)
SARS-CoV-2 is caused by coronavirus	Yes	129 (99.23)	104 (96.3)	199 (95.22)	249 (94.68)	681 (95.92)
SARS-CoV-2 can cause secondary infections	Yes	122 (93.85)	89 (82.41)	178 (85.17)	216 (82.13)	605 (85.21)
SARS-CoV-2 can be spread by coughing droplets	Yes	129 (99.23)	107 (99.07)	209 (100.00)	262 (99.62)	707 (99.58)
SARS-CoV-2 can be transmitted from person to person	Yes	129 (99.23)	106 (98.15)	209 (100.00)	262 (99.62)	706 (99.44)
People with underlying diseases (such as diabetes, cancer, kidney failure, etc.) are susceptible	Yes	126 (96.92)	95 (87.96)	155 (74.16)	198 (75.29)	574 (80.85)
Vomiting and diarrhea are one of the signs and symptoms of the new type of pneumonia	Yes	113 (86.92)	84 (77.78)	141 (67.46)	170 (64.64)	508 (71.55)
Patients infected with the novel coronavirus may have no symptoms or signs	Yes	124 (95.38)	104 (96.30)	188 (89.95)	222 (84.41)	638 (89.86)
The incubation period of the virus is 14 days	Yes	117 (90.00)	86 (79.63)	161 (77.03)	231 (87.83)	595 (83.80)
I know the diagnostic criteria for SARS-CoV-2 infection	Yes	126 (96.92)	95 (87.96)	137 (65.55)	185 (70.34)	543 (76.48)
Antibiotics are effective drugs for treatment of the coronavirus	No	101 (77.69)	91 (84.26)	143 (68.42)	153 (58.17)	488 (68.73)
There are new coronavirus vaccines available	No	120 (92.31)	99 (91.67)	197 (94.26)	220 (83.65)	636 (89.58)
Washing hands with soap and water can prevent the spread of the new coronavirus	Yes	104 (80.00)	79 (73.15)	130 (62.20)	181 (68.82)	494 (69.58)
Cumulative score*		11.08±1.38	10.55±1.69	9.79±1.55	9.69±1.86	

Notes: * *F*=25.102, *P*=1.94E-15. Each score is presented as mean ± standard deviation.

Table 4 Psychological stress levels of different populations towards COVID-19

	Score*				F	P
	Medical staff (*n*=130)	Medical students (*n*=108)	Non-medical students (*n*=209)	Other workers (*n*=263)		
Behavioral response	9.57±4.60	9.96±4.74	10.60±5.00	9.46±3.94	2.754	0.042
Emotional response	16.79±7.21	16.99±7.07	19.18±7.65	17.91±7.22	3.658	0.012
Somatic response	10.88±5.25	11.27±5.71	12.60±6.31	11.63±5.26	2.875	0.035
Cumulative score	37.25±15.69	38.22±16.26	42.38±17.36	39.00±14.42	3.493	0.015

Note: * Each score is expressed as mean ± standard deviation.

respondents agreed with the statement "I am going crazy" compared to 3.24% in other regions. Other options such as "I feel anxious and do not know what to do" (11.11% compared to 3.66%), "I feel scared" (17.78% compared to 7.75%), "I feel nervous and uneasy inside" (17.78% compared to 5.07%) and "I have a worse sleep quality" (13.33% compared to 4.51%) also had significant differences between people in Hubei and other districts. The final results are shown in Table 5.

3 Discussion

One issue worth increased vigilance is that people had a relatively low willingness to seek medical treatment if they had a fever. Roh *et al.*[20] demonstrated that people with poor medical knowledge and low socioeconomic status, as well as those who are single and have lower annual income, are less likely to undergo osteoporosis assessment and treatment. Taking into account the current outbreak stage, many people may choose not to go to the clinic if they have a fever for reasons including avoiding cross-infection and insufficient hospital capacity. Wang *et al.*[21] made it clear that SARS-CoV-2 can be transmitted through airways, contact and fecal-oral route, which may explain the behavior of some mild patients implementing self-isolation at home. Additionally, experts have confirmed that all populations are susceptible to the new coronavirus[9, 21~22]. Thus, basic hygiene knowledge needs to be popularized in the general public, such as not touching eyes and mouth with your hands when going out and covering your mouth and nose with a tissue when coughing.

It is obvious that people with no relevant medical education had a greater stress response according to Table 4. Three factors may contribute to this finding. First, too many reports may confuse people and make them worried[23]. At the time of the study, the topic of SARS-CoV-2 and its risk of transmission were extensively covered by media because of the epidemic in China. Lacking enough medical knowledge, most people can be confused by many reports, leading to reactive stress related to the virus. Second, prevention policy ignored people's mental health at the first stage. The "stay at home rather than going out" policy made people decrease some of their social interactions, which might lead to mental barriers[24]. Moreover, the rapidly changing context of policy during the outbreak might confuse people and increase their worries. Third, nonmedical students lack proper health education. The youth group has lower mental and physical maturity, which might lead to stronger emotional reactions when exposed to bad news. Having more access to reports would get them into constant anxious and

Table 5 Comparison of stress levels between Hubei and other regions

	Score*		F	P
	Hubei Province (*n*=51)	Other districts (*n*=659)		
Behavioral response	11.25±4.67	9.79±4.51	4.981	0.026
Emotional response	22.69±8.38	17.57±7.16	23.565	1.00E-5
Somatic response	14.65±6.83	11.50±5.52	14.837	1.28E-4
Cumulative score	48.59±18.29	38.86±15.53	18.099	2.40E-5

Note: * Each score is presented as mean ± standard deviation.

stressful states[25]. However, the stress response score of medical students (38.22±16.26) was lower than that of nonmedical students (42.38±17.36). This finding shed light on the necessity to add more physical and mental health courses in university or even high school so that students can deal with excessive information exposure in the future.

In particular, when comparing the psychological stress levels of people in different regions and districts, we found that Hubei residents had a greater stress response than people from other districts. First, people in epidemic areas usually had higher stress responses. Hubei is the epicenter of this COVID-19 outbreak. The psychological toll of a disaster on direct victims can be significant[26]. Negative attitudes from netizens and reports related to Hubei could make the situation worse. Some Hubei people went through difficult situations both in Hubei and in other districts, which might cause mental problems or even post-traumatic stress dis order (PTSD)[27]. In addition, the government's coercive measures caused mental panic in locals. Some cities in Hubei were once sealed off from the outside to stop the virus spread, also bringing mental panic in the province. It is necessary for the government's emotions while enforcing policies.

To alleviate the stress levels, we need to take several measures and learn some basic methods, such as trying to reduce the psychological burden caused by overexposure to relevant information, carefully choosing the information resources and limiting the time online. For people who are addicted to the internet, mindfulness-based interventions have been shown to be a good treatment option[28]. Moreover, psychological intervention is highly recommended if the stress level is extremely high, coupled with symptoms including insomnia, irritability, violence and suicidal tendencies.

4 Conclusion

The outbreak and spread of the new coronavirus have aroused widespread concern from people throughout China and even the world. The increasing number of newly diagnosed patients every day, various intensive news reports from the internet and media, and the first-level response measures of public health incidents launched by local governments, have led to a great deal of stress among people. The psychological stress of people in epidemic areas is much higher than that of people in other regions, reminding us that not only treating the disease but also paying attention to the mental health of the people is a priority in such public health events. The survey scores indicate that the more the people's medical understanding, the more the prevention measures are taken, and the lower the levels of psychological stress. This study may have some guiding significance for the future treatment and prognosis of the disease.

Conflict of interest

The authors declare no conflicts of interest.

References:

[1] SUN P, LU X, XU C, *et al*. Understanding of COVID-19 based on current evidence[J]. Journal of Medical Virology, 2020, 92(6): 548-551.

[2] SOHRABI C, ALSAFI Z, O'NEILL N, *et al*. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19)[J]. International Journal of Surgery, 2020, 76: 71-76.

[3] World Health Organization. Situation report-167 coronavirus disease 2019 (COVID-19) [EB/OL]. [2020-07-06]. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200705-covid-19-sitrep-167.pdf?sfvrsn=17e7e3df_2.

[4] LU R, ZHAO X, LI J, *et al*. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding[J]. The Lancet, 2020, 395(10224): 565-574.

[5] BENVENUTO D, GIOVANNETTI M, CICCOZZI A, *et al*. The 2019-new coronavirus epidemic: evidence for virus evolution[J]. Journal of Medical Virology, 2020, 92(4): 455-459.

[6] HUANG C, WANG Y, LI X, *et al*. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China[J]. The Lancet, 2020, 395(10223): 497-506.

[7] ZHU N, ZHANG D, WANG W, *et al*. A novel coronavirus from patients with pneumonia in China, 2019[J]. The New England Journal of Medicine, 2020, 382(8): 727-733.

[8] AYITTEY F K, DZUVOR C, AYITTEY M K, *et al*. Updates on Wuhan 2019 novel coronavirus epidemic[J]. Journal of Medical Virology, 2020, 92(4): 403-407.

[9] LI Q, GUAN X, WU P, *et al*. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia[J]. The New England Journal of Medicine, 2020, 382(13): 1199-1207.

[10] LU H. Drug treatment options for the 2019-new coronavirus (2019-nCoV)[J]. Bioscience Trends, 2020, 14(1): 69-71.

[11] BAWAZIR A, AL-MAZROO E, JRADI H, *et al*. MERS-CoV infection: mind the public knowledge gap[J]. Journal of Infection and Public Health, 2018, 11(1): 89-93.

[12] ALMUTAIRI K M, AL HELIH E M, MOUSSA M, *et al*. Awareness, attitudes, and practices related to coronavirus pandemic among public in Saudi Arabia[J]. Family & Community Health, 2015, 38(4): 332-340.

[13] ALSAHAFI A J, CHENG A C. Knowledge, attitudes and behaviours of healthcare workers in the Kingdom of Saudi Arabia to MERS coronavirus and other emerging infectious diseases[J]. International Journal of Environmental Research & Public Health, 2016, 13(12): 1214.

[14] LIU M, JIANG C, DONOVAN C, *et al*. Middle East respiratory syndrome and medical students: letter from China[J]. International Journal of Environmental Research & Public Health, 2015, 12 (10): 13289-13294.

[15] LIAO Q, COWLING B J, LAM W W, *et al*. Anxiety, worry and cognitive risk estimate in relation to protective behaviors during the 2009 influenza A/H1N1 pandemic in Hong Kong: ten cross-sectional surveys[J]. BioMed Central Infectious Disease, 2014, 14: 169.

[16] WONG M L, ANDERSON J, KNORR T, *et al*. Grit, anxiety, and stress in emergency physicians[J]. The American Journal of Emergency Medicine, 2018, 36(6): 1036-1039.

[17] METCALF K M, BAQUERO B I, CORONADO GARCIA M L, *et al*. Calibration of the global physical activity questionnaire to Accelerometry measured physical activity and sedentary behavior[J]. BioMed Central Public Health, 2018, 18: 412.

[18] 钟霞, 姜乾金, 吴志霞, 等. 生活事件社会支持压力反应对医务人员应对方式的影响[J]. 中国行为医学科学(ZHONG Xia, JIANG Qian-jin, WU Zhi-xia, *et al*. Effect of life events, social support, stress response on coping style in medical personnel[J]. Chinese Journal of Behavioral Medical Science), 2004, 5: 84-86.

[19] KRZYCH L J, LACH M, JONIEC M, *et al*. The Likert scale is a powerful tool for quality of life assessment among patients after minimally invasive coronary surgery[J]. Polish Journal of Cardio-Thoracic Surgery, 2018, 15(2): 130-134.

[20] ROH Y H, LEE E S, AHN J, *et al*. Factors affecting willingness to get assessed and treated for osteoporosis[J]. Osteoporosis International, 2019, 30(7): 1395-1401.

[21] WANG W, TANG J, WEI F. Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China[J]. Journal of Medical Virology, 2020, 92(4): 441-447.

[22] LI X, ZAI J, WANG X, *et al*. Potential of large 'first generation' human-to-human transmission of 2019-nCoV[J]. Journal of Medical Virology, 2020, 92(4): 448-454.

[23] TAN S S, GOONAWARDENE N. Internet health information seeking and the patient-physician relationship: a systematic review[J]. Journal of Medical Internet Research, 2017, 19(1): e9.

[24] CHEN L, HUANG D, MOU X, *et al*. Investigation of quality of life and relevant influence factors in patients awaiting lung transplantation[J]. Journal of Thoracic Disease, 2011, 3(4): 244-248.

[25] JENSSEN B P, KLEIN J D, SALAZAR L F, *et al*. Exposure to tobacco on the internet: content analysis of adolescents' internet use[J]. Pediatrics, 2009, 124(2): e180-e186.

[26] BABAR I, RINKER R. Direct patient care during an acute disaster: chasing the will-o'-the-wisp[J]. Critical Care, 2006, 10: 206.

[27] DOPFEL D, PEREZ P D, VERBITSKY A, *et al*. Individual variability in behavior and functional networks predicts vulnerability using an animal model of PTSD[J]. Nature Communications, 2019, 10: 2372.

[28] GARLAND E L, HOWARD M O. Mindfulness-based treatment of addiction: current state of the field and envisioning the next wave of research[J]. Addiction Science & Clinical Practice, 2018, 13: 14.