



Analysis of Mental Health Status and Social Factors of Patients with COVID-19 Based on Big Data

Shu Tang¹ , Le Chen² , and Xubo Dai³  

¹ School of Basic Medicine, Shaoyang University, 18 Baoqing West Road, Shaoyang, China

² School of Nursing, Xiangnan University, 889 Chenzhou Avenue, Chenzhou, China

³ The Second Affiliated Hospital of Shaoyang University, 18 Baoqing West Road, Shaoyang, China

daixubo0905@163.com

Abstract. Objective: To understand stress response, depression, anxiety and other mental health conditions of COVID-19 patients, social influencing factors and the correlation among them. Methods: A total of 172 patients with COVID-19 in isolation treatment were selected from 3 hospitals by SO JUMP and investigated with Stress Response Questionnaire (SRQ), Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). Results: The patients with COVID-19 pressure response score was 50.31 ± 24.99 , the SAS total score was 41.78 ± 8.90 , and the SDS total score was 46.08 ± 8.36 . FPR, SAS and SDS scores of “ ≥ 60 ” age group was higher than “ < 20 ”, “ $40 \sim$ ” ($P < 0.05$). FER, SAS and SDS score of patients with basic disease was higher than without basic disease patients ($P < 0.05$). Living in rural areas, low education, low income of COVID-19 patients, whose FER, FPR, SR, SAS and SDS scores were higher than other groups ($P < 0.05$). The scores of FER, FPR, FBR, SR, SAS and SDS of self-employed households were the highest among different occupations ($P < 0.05$). The days of isolation treatment ≤ 7 of COVID-19 patients, whose FER, FPR and SR scores were higher than > 7 days ($P < 0.05$). Total stress response score and various dimensions were positively correlated with anxiety and depression. Conclusions: In the face of COVID-19 epidemic, vulnerable groups such as self-employed people, the elderly, women, the sick, farmers, and people at the bottom of society have experienced varying degrees of psychological conditions. Early psychological intervention can effectively relieve stress response, anxiety and depression.

Keywords: Mental health status · Social factors · Patients with COVID-19 · Big Data

1 Introduction

In November 2019, a novel coronavirus disease (COVID-19) was first reported and then became widespread within Wuhan, the capital city of Hubei Province of China. The disease rapidly spread throughout China and elsewhere, becoming a global health

emergency. This study aims to investigate the stress response, anxiety and depression of COVID-19 patients and their social influencing factors, as well as the correlation among them, so as to provide reference for psychological intervention and social support for COVID-19 patients with different characteristics in coping with major public health events.

2 Information and Method

2.1 General Informations

From February 20 to March 6, 2020, investigations were conducted on light and common COVID-19 patients treated in isolation at 2 designated hospitals for COVID-19 in Shaoyang City and Chenzhou City and the counterpart support from Hunan Province's Dabie Mountain Regional Medical Center in Huanggang City, and use the questionnaire star to be guided by the front-line medical staff in the isolation ward, and fill it out on a voluntary basis.

A total of 180 patients with COVID-19 were investigated, 172 valid questionnaires were collected with a recovery rate of 95.56%. Among them, 84 (48.9%) were males and 86 (51.1%) were females. The youngest was 15 years old, and the oldest was 75 years old, with an average age of (43.41 ± 14.26) years old. The shortest treatment time was 1 day, the longest was 43 days, and the average isolation time was (17.20 ± 8.87) days.

2.2 Assessment Methods

2.2.1 Self-written General Information Questionnaire

There were 10 items, including gender, age, residence, educational background, marital status, occupation, annual family income, existence of underlying diseases, time of isolation and treatment, etc.

2.2.2 Stress Response Questionnaire (SRQ)

SRQ was compiled by Jiang Ganjin (Jiang QJ 2005) with a total of 28 items. According to the research needs of Stress system theory model, in order to evaluate the corresponding psychosomatic symptoms and degree of individual psychological Stress Response, Reference anxiety self-assessment scale, depression self rating scale and symptom self-assessment scale items, according to the theory of psychological stress emotional reaction (FER), body (FPR) and behavior (FBR) three dimensions, according to the grades of 1–5 points, entry score (SR) to express the degree of stress reaction score, the higher the greater the degree of stress reaction. The Cronbach's α coefficient of the questionnaire was 0.846, and the Cronbach's α coefficients of emotional response (FER), somatic response (FPR) and behavioral response (FBR) were 0.855, 0.757 and 0.764, respectively.

2.2.3 Self-rating Anxiety Scale (SAS)

SAS was compiled by Zung (Zhang ZJ 2005), with a total of 20 items, reflecting patients' subjective feelings of Anxiety. According to the frequency of symptoms defined by the

items, the Scale was divided into 4 levels. The positive items were rated as 1, 2, 3 and 4 points in turn. Reverse grading, in turn rated as 4, 3, 2, 1 points. The scores of 20 items are added together, namely the total rough score, which is converted into standard score. The standard score (the total score of 20 items multiplied by 1.25 to be an integer) has a cutoff of 50 points, with 50 to 59 for mild anxiety, 60 to 69 for moderate anxiety, and ≥ 70 for severe anxiety. The Cronbach's α coefficient of the questionnaire was 0.893.

2.2.4 Self-rating Depression Scale (SDS)

SDS was compiled by Zung (Zhang ZJ 2005), consists of 20 items, reflecting patients' subjective feelings of Depression. The scoring method is the same as SAS. The total score ≤ 49 is considered normal, and the total score 50–59 is considered mild Depression. A total score of 60–69 was classified as moderate depression, and a total score of ≥ 70 was classified as severe depression. The higher the score, the more severe the depression was. The Cronbach's α coefficient of the questionnaire was 0.912.

2.3 Data Analysis

SPSS20.0 statistical software was used for statistical analysis. Two-sample t-test and one-way ANOVA were used to compare the scores between groups, and correlation analysis was used for the relationship between anxiety, depression and emergency response, the test level was $\alpha = 0.05$.

3 Results

3.1 General Conditions of Stress Response, Anxiety and Depression in COVID-19 Patients

The total stress response (SR) of COVID-19 patients in this investigation was 50.31 ± 24.99 , the total score of SAS was 41.78 ± 8.90 , and the total score of SDS was 46.08 ± 8.36 , as shown in Table 1. In SAS: 145 people were normal, accounting for 84.3%; 23 people were mildly anxious, accounting for 13.4%; 4 people were severely anxious, accounting for 2.3%. In SDS: 133 persons were normal, accounting for 77.3%; 26 persons were mildly depressed, accounting for 15.1%; 9 persons were moderately depressed, accounting for 5.2%; 4 persons were severely depressed, accounting for 2.3%.

3.2 Comparison of SRQ, SAS and SDS Scores of COVID-19 Patients with Different Characteristics

The scores of FER, FPR, FBR, SR, SAS and SDS in female patients with COVID-19 were higher than those in male patients ($P < 0.05$). The scores of FPR, SAS and SDS in " ≥ 60 " group were higher than those in " < 20 " and " $40\sim$ " group ($P < 0.05$). FER, FPR, SR, SAS and SDS scores of COVID-19 patients in rural areas were higher than those in urban areas ($P < 0.05$). FER, FPR, SR, SAS and SDS scores in primary school and

Table 1. The scores of SRQ, SAS and SDS were compared for different factors ($\bar{x} \pm S$)

	Factors	n	FER	FPR	FBR	SR	SAS	SDS
Total	172	20.83±1.91	16.36±9.18	9.83±4.63	50.31±24.99	41.78±8.90	46.08±8.36	
Gender								
Male	84	18.62±9.81	13.81±7.76	8.76±3.14	43.98±18.90	39.40±7.26	44.35±7.16	
Female	88	22.93±14.33	18.80±9.83	10.84±5.56	56.36±28.58	44.06±9.73	47.73±9.10	
<i>t</i>		-2.306	-3.702	-3.020	-3.356	-3.546	-2.701	
<i>P</i>		0.021	0.000	0.003	0.001	0.001	0.008	
Age								
< 20	12	17.00±8.15	11.83±4.92 ^b	8.00±2.53	39.17±13.12	38.13±8.11 ^b	43.48±6.88 ^b	
20~	54	20.74±12.65	17.11±9.20	10.00±4.35	51.59±23.76	42.96±7.46	46.54±7.72	
40~	84	20.60±12.56	15.31±9.11 ^b	10.19±5.26	49.02±26.54	40.21±8.69 ^b	45.00±8.20 ^b	
≥60	22	24.00±14.19	21.00±10.07 ^a	9.00±3.61	58.18±26.68	46.93±11.04 ^a	50.49±9.93 ^a	
<i>F</i>		0.868	3.502	1.061	1.674	4.599	3.055	
<i>P</i>		0.459	0.017	0.371	0.174	0.004	0.030	
Place of residence								
Rural	40	30.05±16.00	22.15±9.86	11.35±4.75	67.40±28.79	45.31±9.26	48.76±9.46	
City	132	18.03±9.68	14.61±8.26	9.36±4.53	45.14±21.38	40.72±8.54	45.27±7.86	
<i>t</i>		5.865	4.864	2.416	5.334	2.923	2.344	
<i>P</i>		0.000	0.000	0.017	0.000	0.004	0.020	
Educational background								
Elementary school and below								
	12	29.83±21.39 ^a	24.50±11.05 ^a	11.33±7.87	70.50±39.24 ^a	52.08±15.53 ^a	55.10±14.16 ^a	
Junior high school								
	78	21.13±13.61 ^b	16.31±9.33 ^b	9.97±4.69	50.67±26.12 ^b	41.12±8.69 ^b	45.80±8.40 ^b	
High school or Secondary school								
	48	20.08±10.69 ^b	16.79±9.85 ^b	9.46±3.34	49.54±24.24 ^b	42.14±7.18 ^b	46.88±5.84 ^b	
College and above								
	34	18.00±6.06 ^b	13.00±5.09 ^b	9.48±3.34	43.47±12.89 ^b	39.19±5.79 ^b	42.40±6.10 ^b	
<i>F</i>		2.855	5.067	0.617	3.666	7.198	7.885	
<i>P</i>		0.039	0.002	0.605	0.014	0.000	0.000	
Marital status								
Unmarried	22	17.00±7.29	14.27±5.82	9.36±3.07	47.91±13.57	43.18±9.96	47.58±8.30	
Married	132	22.08±13.25	16.88±9.38	10.14±4.98	52.41±26.36	41.65±8.96	45.70±8.69	
Other	18	16.33±9.89	15.11±11.29	8.11±3.22	42.78±24.52	41.11±7.75	47.04±5.61	
<i>F</i>		2.958	0.952	1.661	2.042	0.336	0.607	
<i>P</i>		0.055	0.388	0.193	0.133	0.715	0.546	
Profession								
Student								
	10	18.00±8.69	12.60±5.08 ^b	8.00±2.92 ^b	41.00±13.80 ^b	40.50±7.43 ^b	45.43±6.49 ^b	
Enterprise workers								
	46	16.61±5.25 ^b	12.74±4.82 ^b	8.83±3.63 ^b	41.39±11.50 ^b	38.53±5.64 ^b	42.45±5.56 ^b	
Small private business								
	30	29.87±16.99 ^a	24.40±5.07 ^a	12.20±5.07 ^a	70.27±30.56 ^a	49.92±11.07 ^a	53.53±10.20 ^b	
Farming or Unemployed								
	40	20.35±11.73 ^b	17.35±9.62 ^b	10.20±5.86	51.20±25.41 ^b	41.06±8.01 ^b	45.71±8.60 ^b	
Other								
	46	20.17±13.36 ^b	14.70±9.15 ^b	9.35±4.03 ^b	47.48±26.64 ^b	40.65±8.14 ^b	45.31±6.62 ^b	
<i>F</i>		6.139	10.376	3.263	7.893	9.770	10.000	
<i>P</i>		0.000	0.000	0.013	0.000	0.000	0.000	
Annual income (yuan)								
≤5	50	26.32±16.04 ^a	20.48±10.14 ^a	11.24±5.70	61.60±30.43 ^a	47.10±10.24 ^a	50.36±1.42 ^a	
6~	50	17.76±11.15 ^b	14.04±7.87 ^b	8.24±3.77	43.48±21.01 ^b	38.30±7.27 ^b	43.60±7.53 ^b	
>10	72	19.14±9.15 ^b	15.11±8.60 ^b	9.94±4.11	47.22±21.08 ^b	40.52±7.19 ^b	44.84±6.42 ^b	
<i>F</i>		7.635	7.941	1.750	8.204	15.824	10.616	
<i>P</i>		0.001	0.001	0.071	0.000	0.000	0.000	
With or without underlying disease								
With	34	24.88±14.13	17.82±9.14	11.00±4.70	56.88±26.59	46.18±8.90	50.19±8.67	
Without	138	19.83±11.80	16.00±9.15	9.54±4.57	48.70±24.31	40.71±8.59	45.07±7.99	
<i>t</i>		2.150	1.041	1.664	1.726	3.303	3.292	

(continued)

Table 1. (continued)

	<i>P</i> 0.033	0.299	0.098	0.086	0.001	0.000	
Isolated treatment time (days)							
≤7	26	25.54±14.79	19.77±10.38	10.85±5.09	59.23±28.76	43.27±8.58	46.70±8.73
>7	146	19.99±11.81	15.75±8.81	9.64±4.53	48.73±23.93	41.52±8.96	45.97±8.32
<i>t</i>		2.122	2.082	1.225	1.998	0.921	0.408
<i>P</i>		0.035	0.039	0.222	0.047	0.358	0.684

Note: The superscript letters are different in the groups, and the difference between the groups is statistically significant.

Table 2. Correlation analysis of SRQ, SAS and SDS in patients with COVID-19 (*r*-value)

	FER	FPR	FBR	SR	SAS	SDS
FER	1					
FPR	0.788**	1				
FBR	0.699**	0.788**	1			
SR	0.936**	0.940**	0.848**	1		
SAS	0.715**	0.707**	0.616**	0.751**	1	
SDS	0.674**	0.649**	0.574**	0.696**	0.911**	1

** *P*<0.01

below education groups were higher than those in other education groups (*P* < 0.05). The scores of FER, FPR, FBR, SR, SAS and SDS of self-employed workers were higher than those of non-self-employed workers (*P* < 0.05). The scores of FER, FPR, SR, SAS and SDS in “≤5” group were higher than those in the other two groups (*P* < 0.05). FER score, SAS score and SDS score in patients with basic disease were higher than those without basic disease (*P* < 0.05). The scores of FER, FPR and SR were higher than those of > for 7 days (*P* < 0.05). The details are shown in Table 1.

3.3 Correlation Analysis of Stress Response, Anxiety and Depression in Patients with COVID-19

Total stress response score and various dimensions were positively correlated with anxiety and depression. The details are shown in Table 2.

4 Discussion

The results of this study showed that stress reaction, anxiety and depression symptoms were rare among the investigated COVID-19 patients, which was similar to the results of the study of Cao Jing (Cao J & Wen M 2020).

FER, FPR, FBR, SR scores, SAS and SDS scores of female COVID-19 patients were all higher than those of men, which is similar to some domestic and foreign scholars (Maclean SA 2008, Zhang N 2010). The possible reason is that men and women have

different psychological cognition and coping strategies (Maclean SA 2008). Women tend to use meditation strategies more than men after stress events. However, this strategy is more difficult to actively reassess emotions, so it is more prone to post-traumatic stress reaction (An XL 2014), such as fear, anxiety, depression and other adverse emotional reactions.

The FPR score, SAS and SDS score of the “ ≥ 60 ” group were higher than those of the “ < 20 ” and “ $40\sim$ ” group. Considering that people over 60 years old are the elderly, their physical functions decline rapidly, and they are more prone to adverse physical reactions such as elevated blood glucose, elevated blood pressure, accelerated heart rate and accelerated respiration when they encounter trauma. The FER score and the total score of SAS and SDS in patients with basic diseases were higher than those without basic diseases, which may be due to the relatively poor physical condition of patients with basic diseases, combined with COVID-19, resulting in greater mental burden, and some of them even showed anxiety, depression and other psychological and emotional reactions.

Compared with urban residents, COVID-19 patients living in rural areas are more likely to suffer from panic, hypochondria, anxiety, depression and other emotional reactions due to their relatively isolated information and personal deviation in understanding of the epidemic situation and disease. And the adverse emotional reaction is easy to induce a series of behavioral reactions such as aggression, indifference, pathological stubbornness, so that the overall stress level is also increased.

Different degree in different levels of employment and the level of education can improve the cognitive ability, able to correctly treat bad feelings or negative event, conversely, patients with lower cultural degree, due to the cultural knowledge level is limited, in the social environment of self-esteem and self-confidence is insufficient, little knowledge of disease, psychological and emotional demand, are prone to stress reaction, More prone to emotional instability, anxiety and depression (Wu JJ 2016).

The “ ≤ 5 ” group of annual income (10,000) belongs to the low-income group, whose economic foundation determines the superstructure. This group is relatively deficient in medical care, employment, social security and other aspects. The arrival of the epidemic will undoubtedly make the low-income patients worse, with the most worries and concerns from all sides, which will aggravate anxiety and depression. In the case of stress, anxiety and depression, cortisol content in the body increases, and high cortisol level will damage immune function (Wu LL 2003), so both physical and emotional responses are stronger.

The self-employed (also known as “individual industrial and commercial households”) are the operators who are mainly engaged in business activities based on personal or family labor and who have been approved and registered according to law and obtained business qualifications. They have no fixed economic source, and their income is closely related to their personal business conditions. Moreover, because of their small scale, single business and irregular management, their ability to bear risks is relatively low. The long duration of the epidemic will certainly lead to the decline of the operating conditions of individual merchants, but they still need to pay related taxes, rents, commissions and other fees. The huge economic pressure is easy to cause psychological stress, so it is easy to increase the stress response of such people in all aspects, and

aggravate the anxiety and depression. FER, FPR and SR scores of patients with isolation treatment days ≤ 7 days were higher than those of > 7 days, which was inconsistent with previous studies (Guan H 2006, Wang HH 2010, Tang CS 2007).

In this survey, we found that 98.8% of patients received health education or psychological assistance from medical staff and psychological crisis intervention staff actively or passively during the isolation period, and early clinical psychological intervention is helpful for the recovery of patients with acute stress disorder (ASD) (Roberts NP 2010, Peris A & Bonizzoli M 2011, Zhao GQ 2008) which is conducive to the prevention of post-traumatic stress disorder (PTSD). A large number of media reports show that after the COVID-19 outbreak, China's awareness of and attention to mental health and psychological services has reached an unprecedented level, far exceeding the SARS period and the Wenchuan earthquake. The results of this survey also confirmed that early psychological intervention was effective in response to stress, anxiety, depression, etc. Therefore, with the implementation of psychological crisis intervention and the adjustment of psychological state, the stress response, anxiety and depression of COVID-19 patients decreased during the isolation treatment in hospital.

In conclusion, in the face of the COVID-19 epidemic, we should focus on women, the elderly, people with basic diseases, people living in rural areas, the bottom of society (low education, low income) and other vulnerable groups (i.e., the elderly, women, patients, farmers, families) as well as the self-employed, and the state should adopt corresponding policies to help restore production. At the same time, it has been proved that early psychological intervention is positive and effective in coping with stress response, anxiety and depression of major public health events.

Acknowledgements. This paper is funded by Outstanding Youth Program of Hunan Provincial Department of Education (20B520), Project of Hunan Provincial Social Science Achievement Review Committee (XSP21YBC388), Chenzhou City Social Science Planning Project (czssk12021074). Hunan Provincial Department of Education (19C1715).

References

- An XL (2014). Gender differences in the relationship between emotion regulation strategies and symptoms of post-traumatic stress disorder. *Chinese Journal of Health Psychology* 22 (12), 1798-1801.
- Cao J & Wen M (2020). Investigation of anxiety and depression and influencing factors in patients with novel coronavirus pneumonia. *Journal of Nursing Science*: 15-17.
- Guan H (2006). Analysis of mental health and related factors of SARS patients. *China Hospital Statistics*. 13(2): 135-137.
- Jiang QJ (2005). *Medical Psychology*: 75-81.
- Maclean S A (2008). Prevalence and Correlates of Probable Depression and Post-traumatic Stress Disorder among Female Sex Workers in Lilongwe Malawi. *Int Ment Health Addict*, (1): 150-163.
- Peris A, Bonizzoli M, (2011) Early inpatient intensive care unit psychological intervention promotes recovery from post traumatic stress disorders, anxiety and depression symptoms in critically ill patients. *Crit Care* 15(1): R41.

- Roberts NP (2010). Early psychological interventions to treat acute traumatic stress symptoms. *Cochrane Database Syst Rev.* (3): CD007944.
- Tang CS (2007). Trajectory of traumatic stress symptoms in the after math of extreme natural disaster: a study of adult thai survivors of the 2004 Southeast Asian earthquake and tsunami. *J Nerv Ment Dis.* 195(1): 54-59.
- Wang HH (2010). Psychopathological, biological, and neuroimaging characterization of post traumatic stress disorder in survivors of a severe coalmining disaster in China. *Psychiatr Res.* 44(6): 385-392.
- Wu JJ (2016). Investigation status and related factors analysis of postpartum depression in a hospital in Xinyang City. *Chinese Journal of Disease Control* 20(1): 96-98.
- Wu LL (2003). Psychological preparations for the possible reappearance of atypical pneumonia. *Health Vocational Education* (11): 150.
- Zhao GQ (2008). Incidence and influencing factors of acute stress disorder after the Wenchuan earthquake. *Chinese Journal of Preventive Medicine.* 42(11): 802-805.
- Zhang N (2010). Post-traumatic stress disorder and its influencing factors in survivors of the Wenchuan earthquake. *Chinese Journal of Clinical Psychology* 18(1): 69-72.
- Zhang ZJ (2005). *Handbook of Chinese Behavioral Medicine Scale*: 213-223.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

