

Application Note

Investigation and analysis of psychological stress among non-severe COVID-19 patients

The coronavirus disease 2019 (COVID-19) outbreak continues to spread rapidly around the world. By the end of 2020, there have been nearly 80 million confirmed cases and over 1.7 million deaths associated with COVID-19 globally (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019>), with an estimated mortality rate of 0.03%–40% (Wiersinga et al., 2020). Noticeably, the COVID-19 is predicted to threaten millions of people throughout the world in the coming months and years.

Disasters and diseases often cause severe psychological stress that leads to serious short- and long-term consequences on the lives of those affected. Previous studies regarding COVID-19-associated psychological stress have primarily focused on the general population, healthcare workers, psychiatric patients, general workforce, and people staying in rural areas (Chew et al., 2020; Wang et al., 2020b). However, the psychological ramifications of the COVID-19 pandemic on patients are not yet well documented. In this study, we aimed to investigate and analyze the impact of psychological stress in non-severe COVID-19 patients, who were capable of completing the study questionnaire (see [Supplementary material](#) for detailed participant inclusion criteria).

Demographic information of mild to moderate COVID-19 patients was collected from Union Red Cross Hospital in Wuhan, China, from February 13, 2020 to

February 29, 2020. There were 90 participants in this study with a mean age of 58.87 ± 11.75 years old (range: 23–82). Sources of psychological stress included concerns regarding physical health and disease progression (84.44%), family members contracting COVID-19 (48.89%), treatment efficacy or prognosis (40%), treatment side effects (31.11%), economic burdens (15.55%), disease-related shame or stigma (15.55%), a lack of familiarity with isolation and the hospital environment (13.33%), and concerns regarding future work and study (6.67%). Their perceived stress, post-traumatic stress disorder (PTSD), anxiety, and depression were evaluated using the appropriate and standardized Perceived Stress Scale-10 (PSS-10), PTSD Checklist-5 (PCL-5), and Hospital Anxiety and Depression Scale (HADS) questionnaires, respectively. All the self-reported scoring materials employed in this study have been already validated and widely used in clinics, exhibiting an excellent Cronbach's alpha of 0.830–0.955.

The PSS-10 is a widely used psychological instrument for estimating stress perception. The average PSS-10 score in the overall patient population was 19.31 ± 5.19 , nearly similar to that observed among SARS patients in 2003 (19.6 ± 4.8) (Lee et al., 2007). Among 90 patients in this study, PSS-10 scores of 80 patients (88.89%) were higher than the established community norm of 12, a well-validated value for healthy as well as stressed populations (Chua et al., 2004). We found significant differences in PSS-10 scores among patients as a function of patient age, sex, marital status, educational level, symptom duration, chronic disease status, and whether or not their family members or

close contacts had confirmed or suspected COVID-19 ($P < 0.05$; [Table 1](#)).

The PCL-5 is used for assessing the presence and severity of PTSD symptoms. The average PCL-5 score in this patient population was 21.20 ± 12.34 . Based on the defined cut-off criteria (≥ 33) for the PCL-5 scale, 20 out of these 90 patients (22.22%) scored above the threshold, suggesting the potential for a tentative PTSD diagnosis (Verhey et al., 2018). This percentage (22.22%) was markedly higher than the observed 7% in the general population in the hardest-hit areas of Wuhan during this same period (Liu et al., 2020). Similarly, there were differences in PCL-5 scores among patients as a function of patient age, sex, marital status, educational level, and chronic disease status ($P < 0.05$; [Table 1](#)).

The HADS is commonly used for determining the levels of anxiety (HADS-A) and depression (HADS-D) in non-psychiatric patients. The average HADS-A and HADS-D scores among patients in this study were 9.02 ± 3.99 and 8.73 ± 4.51 , respectively. Using a cut-off score of 8, 63 patients (70%) exhibited anxiety scores ≥ 8 , while 56 patients (62.2%) exhibited depression scores ≥ 8 . These levels were far greater than those observed in the general public during this same period (Wang et al., 2020a). We then observed significant differences in HADS-A scores among patients as a function of patient age, sex, marital status, educational status, symptom duration, chronic disease status, and whether or not their family members or close contacts had confirmed or suspected COVID-19 ($P < 0.05$; [Table 2](#)). Similarly, HADS-D scores differed significantly in patients' marital status,

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Table 1 Comparison of PSS-10 and PCL-5 scores among COVID-19 patients.

Item	Number of patients	PSS-10	F/t	P	PCL-5	F/t	P
Age (year)							
<40	10	14.20±4.82			14.20±7.05		
40–60	26	18.23±4.95	4.370	0.019	19.15±11.96	1.477	0.043
≥60	54	20.78±4.77			23.48±12.34		
Sex							
Male	32	17.25±6.44	2.020	0.033	19.19±10.99	1.810	0.023
Female	58	20.90±4.07			23.31±12.70		
Marital status							
Unmarried	4	13.00±7.07			10.12±4.24		
Married	72	19.00±4.83	3.383	0.043	20.86±11.28	1.427	0.034
Divorced or widowed	14	22.71±5.06			27.14±17.33		
Education							
Junior high school or below	24	20.75±4.77			23.43±15.58		
Senior high/secondary school	34	21.53±3.17	5.124	0.039	27.29±9.62	4.853	0.006
College/associate degree	12	17.50±6.70			12.33±8.38		
Bachelor degree or above	20	14.90±5.09			13.50±17.01		
Duration of symptoms (week)							
1–2	40	18.45±5.84			22.25±14.40		
3–4	36	19.33±4.04	2.029	0.036	19.50±10.08	0.277	0.759
>4	14	22.71±5.79			22.57±12.53		
Whether there are confirmed or suspected cases in their family or close contacts							
NO	34	21.29±3.89	2.072	0.044	23.47±12.10	0.067	0.068
YES	56	18.11±5.56			19.21±12.27		
Whether or not combined with chronic disease							
NO	54	19.15±5.33	2.255	0.027	19.26±14.08	1.303	0.030
YES	36	21.56±5.11			24.11±8.71		

PSS-10 and PCL-5 scores are presented as mean ± standard deviation. PSS-10 score ranges from 0 to 40, with higher scores indicating greater stress. PCL-5 score ranges from 0 to 80. A total score of 33 or higher suggests that the patient needs further assessment to confirm a diagnosis of PTSD.

symptom duration, and chronic disease status ($P < 0.05$; Table 2).

Pairwise Pearson correlation analyses revealed that PSS-10, PCL-5, HADS-A, and HADS-D scores were positively correlated with each other ($r = 0.661$ – 0.781 , $P < 0.01$). Multiple linear regression analyses revealed that PSS-10 and HADS-A scores were associated with patient age, sex, marital status, educational level, chronic disease status, symptom duration, and whether or not their family members or close contacts had confirmed or suspected COVID-19 ($t = -2.627$ to 2.178 , $P < 0.05$). Additional analysis showed that PCL-5 scores were related to patient sex, educational level, marital status, and chronic disease status ($t = -2.760$ to 2.574 , $P < 0.05$). Similarly, HADS-D scores were found related to patient marital status, symptom duration, and chronic disease status ($t = -0.216$ to 0.211 , $P < 0.05$).

We also found that psychological stress levels were significantly higher in COVID-19 patients with one of the characteristics including ≥ 60 years of age,

female gender, divorced or widowed, with a high school/secondary school level education or below, suffered from chronic diseases, suffered from symptoms for >4 weeks, and without confirmed or suspected cases in their family or close contacts. Perceived stress levels were higher among elderly individuals than any other analyzed groups ($P < 0.05$), potentially because these individuals exhibited physical deterioration and poorer adaptability. In addition, such individuals combined with chronic diseases or suffered symptoms for a long time may require prolonged hospitalization, increasing their sense of uncertainty and anxiety. We observed higher PSS-10, PCL-5, and HADS-A scores in female patients, which were consistent with prior epidemiological results, suggesting that women suffer from a more significant outbreak-associated stress and anxiety (Wang et al., 2020a). However, we did not observe any significant differences in depression between men and women, potentially suggesting that women have effective coping strategies in this

context. Patients with a high/secondary school education also exhibited greater stress and anxiety compared with other groups, which may be caused by lower income, poorer social support, and a lack of awareness regarding this disease. Divorced and widowed individuals exhibited higher levels of psychological stress compared to married individuals ($P < 0.05$), potentially due to a lack of companionship, encouragement, comfort, or support from their partners. Patients that did not have any confirmed or suspected COVID-19 cases among their family or close contacts also exhibited higher levels of perceived stress and anxiety, potentially due to their fear of spreading this disease or disease-related stigma.

In conclusion, our present study suggests that patients with non-severe COVID-19 may suffer from severe psychological stress, which can potentially exacerbate this disease, in turn leading to an increase in psychological stress that may create a vicious and deleterious cycle. Encouragingly, China has

Table 2 Comparison of HADS-A and HADS-D scores among COVID-19 patients.

Item	Number of patients	HADS-A	F/t	P	HADS-D	F/t	P
Age (year)							
<40	10	7.00±2.35			7.40±2.61		
40–60	26	6.77±4.17	2.892	0.042	7.93±4.24	1.612	0.212
≥60	54	9.63±3.85			9.70±4.62		
Sex							
Male	32	7.25±3.33			7.56±4.05		
Female	58	9.96±3.00	2.323	0.027	8.83±4.80	0.187	0.251
Marital status							
Unmarried	4	5.03±2.83			5.00±1.41		
Married	72	8.25±3.52	2.175	0.025	8.42±4.11	2.133	0.031
Divorced or widowed	14	11.86±5.67			12.43±5.99		
Education							
Junior high school or below	24	9.00±4.77			9.08±4.81		
Senior high/secondary school	34	10.35±3.85	3.646	0.020	10.18±4.32	1.941	0.221
College/associate degree	12	6.00±2.64			7.53±5.01		
Bachelor degree or above	20	6.30±3.02			6.90±3.71		
Duration of symptoms (week)							
1–2	40	7.10±4.34			6.30±4.27		
3–4	36	8.44±3.00	3.496	0.012	8.72±4.43	2.473	0.027
>4	14	10.86±5.37			10.23±5.75		
Whether there are confirmed or suspected cases in their family or close contacts							
NO	34	9.94±4.17			9.53±4.59		
YES	56	7.82±3.78	2.511	0.038	8.25±4.46	0.922	0.253
Whether or not combined with chronic disease							
NO	54	7.70±3.03			7.02±4.99		
YES	36	10.22±3.18	2.977	0.022	9.20±3.80	2.053	0.043

HADS-A and HADS-D scores are presented as mean ± standard deviation. The total score of the HADS-A ranges from 0 to 21, and scores of 8–10, 11–14, and 15–21 indicate mild, moderate, and severe anxiety, respectively. The total score of the HADS-D ranges from 0 to 21, and scores of 8–10, 11–14, and 15–21 indicate mild, moderate, and severe depression, respectively.

successfully managed to control the pandemic rapidly and effectively, which has some implications for the epidemic to the world. Psychosocial stress management and response strategies must be implemented immediately by the government and health-care workers to effectively cope with these problems from various strata of society. The government and health authorities should offer accurate and timely information pertaining to the disease to mitigate rumor-associated damage. It is also important that patients should be provided with treatment plans, status updates, and progress reports. Furthermore, safe forms of communication between family members and patients should be encouraged, so that they would not feel their state of social isolation. Besides, patients should undergo regular mental health screenings, timely counseling, or other forms of graded psychological intervention, such as assistance hotlines being available, to help patients deal with the present crisis. Additional

measures are needed to identify those individuals most in need of psychological interventions, and further work is required to determine which interventions are most effective. Psychosocial preparedness is important by creating mental institutions that are unique to potential pandemics.

Admittedly, this study has several limitations. For example, this study had a relatively small sample size compared to the worldwide spread of the disease. Moreover, this study was conducted in the Chinese population, and thus other studies in different populations are needed for proper validation of the results from this study. Additionally, the results of this study were based on subjective self-reported questionnaires. Further analyses of objective measures such as serum cortisol levels will be required for a complete understanding of the psychological stress of these patients.

[Supplementary material is available at *Journal of Molecular Cell Biology* online.

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