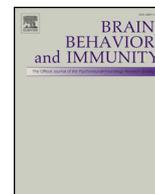




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## Do psychiatric patients experience more psychiatric symptoms during COVID-19 pandemic and lockdown? A case-control study with service and research implications for immunopsychiatry

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## ABSTRACT

This study aimed to assess and compare the immediate stress and psychological impact experienced by people with and without psychiatric illnesses during the peak of 2019 coronavirus disease (COVID-19) epidemic with strict lockdown measures. Seventy-six psychiatric patients and 109 healthy control subjects were recruited from Chongqing, China and completed a survey on demographic data, physical symptoms during the past 14 days and a range of psychiatric symptoms using the Impact of Event Scale-Revised (IES-R), Depression, Anxiety and Stress Scale (DASS-21) and Insomnia Severity Index (ISI). IES-R measures PTSD symptoms in survivorship after an event. DASS-21 is based on tripartite model of psychopathology that comprise a general distress construct with distinct characteristics. The mean IES-R, DASS-21 anxiety, depression and stress subscale and ISI scores were higher in psychiatric patients than healthy controls ( $p < 0.001$ ). Serious worries about their physical health, anger and impulsivity and intense suicidal ideation were significantly higher in psychiatric patients than healthy controls ( $p < 0.05$ ). More than one-third of psychiatric patients might fulfil the diagnostic criteria post-traumatic stress disorder (PTSD). More than one-quarter of psychiatric patients suffered from moderately severe to severe insomnia. Respondents who reported no change, poor or worse physical health status and had a psychiatric illness were significantly more likely to have higher mean IES-R, DASS depression, anxiety and stress subscale scores and ISI scores ( $p < 0.05$ ). This study confirms the severity of negative psychological impact on psychiatric patients during the COVID-19 epidemic with strict lockdown measures. Understanding the psychological impact on psychiatric patients during the COVID-19 pandemic has the potential to provide insight into how to develop a new immunopsychiatry service. Further research is required to compare pro-inflammatory cytokines between psychiatric patients and healthy controls during the pandemic.

## 1. Introduction

The 2019 coronavirus disease (COVID-19) is highly infectious and

potentially fatal (Colizzi et al., 2020). Its psychological impact on persons with mental disorders remains unknown. In the absence of a cure or vaccine against COVID-19, lockdown, isolation, quarantine and

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limiting community interaction are main psychoneuroimmunity prevention strategies proposed by Kim and Su (2020) to reduce pathogen exposure (Kim and Su, 2020). A recent study found that quarantine was not related with the prevalence of mental health problems in the general population (Zhu et al., 2020). Nevertheless, the COVID-19 pandemic has a sudden and massive impact on health care infrastructure, transportation, daily activity, freedom of movement, and distribution of medical resources globally (Gautam and Sharma, 2020; Joob and Wiwanitkit, 2020; Simpson and Katsanis, 2020). The sudden changes could significantly impact the mental health of psychiatric patients as well as reducing their access to psychiatric services (Montemurro, 2020). Furthermore, mental health providers could be burnt out as they might be deployed to look after COVID-19 patients (Kim and Su, 2020). Rightfully, focus of health services has primarily been placed on COVID-19. However, we must also be mindful and ensure that psychiatric services are not neglected in the present pandemic. As the psychiatric inpatient wards were found to be perfect breeding ground for the coronavirus (Kim and Su, 2020), most of the stable psychiatric patients should receive treatment at home to reduce the risk of infection.

Managing psychiatric patients during the COVID-19 pandemic poses a variety of challenges for psychiatrists. Ideally, immunopsychiatry service should safeguard physical and mental health of psychiatric patients by providing telepsychiatry consultation, home delivery of medications, psychological support, rapid testing for coronavirus and monitoring inflammatory markers related to stress and depression during a large infection outbreak. The immunopsychiatry service addresses the biopsychosocial aspects of COVID-19 pandemic (Kim and Su, 2020). Due to the sudden outbreak and lack of experience with COVID-19, most mental health services were unprepared to provide above services and not able to reach out to psychiatric patients during the lockdown. As a result, the needs of psychiatric patients are being neglected during the pandemic. Although there are few known studies to date about the effect of COVID-19 pandemic on the mental health of the general population (Li et al., 2020; Qiu et al., 2020; Wang et al., 2020a,b), COVID patients (Zhang et al., 2020), health professionals (Chew et al., 2020; Mukhtar, 2020; Shi et al., 2020; Tan et al., 2020a) and workers who returned to work (Tan et al., 2020b), there remains little research on the psychological impact and mental health of psychiatric patients living in the community during the COVID-19 pandemic.

This study aimed to assess and compare the immediate stress and psychological impact experienced by people with and without psychiatric illnesses during the peak of the COVID-19 epidemic with strict lockdown measures. This information has the potential to uncover the differences in mental health needs in people with and without psychiatric illnesses during the pandemic and helps to develop a new immunopsychiatry service for future outbreak of infectious disease. We hypothesised that there were no differences between the levels of depression, anxiety, stress, and psychological impact encountered by people with and without psychiatric illnesses during the peak of the COVID-19 epidemic with strict lockdown measures.

## 2. Methods

### 2.1. 1 Participants

An online questionnaire was administered via SMS to psychiatric patients from the databases of the First People's Hospital of Chongqing Liang Jiang New Area, China. Due to lockdown measures, this study was conducted via electronic means because the local government prohibited face-to-face contact. The First People's Hospital of Chongqing Liang Jiang New Area is a designated hospital for COVID-19, where 17 patients were reported infected when this study was conducted. The psychiatric patients were recruited from 19 to 21 February 2020, and healthy control participants were recruited from 21

to 22 February 2020. A short recruitment period allowed us to measure the psychological impact during the peak of the COVID-19 epidemic when strict lockdown measures for all people in the city were in place. The healthy control participants were recruited through convenient sampling. Written informed consent was obtained from all participants. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration. All procedures involving human subjects/patients were approved by Ethics Review Committee of The First People's Hospital of Chongqing Liang Jiang New Area (IRB No. 2020-02-001).

### 2.2. Inclusion and exclusion criteria

The inclusion criteria were different for psychiatric patients and healthy controls. All psychiatric patients must be aged 18 years or above and be previously diagnosed by psychiatrists to suffer from F32 Major Depressive Disorder–single episode, F33 Major depressive disorder–recurrent episodes, F41 other anxiety disorders including generalised anxiety disorder, panic disorder, and F41.8 mixed anxiety and depressive disorder based on the 10th revision of the International Statistical Classification of Diseases and related Health Problems (ICD-10) criteria. Healthy control subjects were aged 18 years or above who did not have a history of psychiatric illnesses. Exclusion criteria included lack of mobile phone number and Internet access, inability to complete an online survey, presence of chronic medical disorders including neurological, cardiovascular, respiratory, endocrine and inflammatory disorders, suspected or confirmed cases of COVID-19.

### 2.3. Measures

The structured questionnaire consisted of questions that covered several areas: (1) demographic data; (2) physical symptoms resembling COVID-19 infection and self-rating physical health status in the past 14 days; (3) Impact of Event Scale-Revised (IES-R), (4) Depression, Anxiety and Stress Scale (DASS-21), (5) The insomnia Severity Index (ISI), and (6) Other psychiatric symptoms.

The psychological impact of the COVID-19 epidemic was measured using the Impact of Event Scale-Revised (IES-R) that measures post-traumatic stress disorder (PTSD) symptoms in survivorship during COVID-19 pandemic (Tan et al., 2020a; Wang et al., 2020a,b). The IES-R is a self-administered questionnaire that has been well-validated in the Chinese population for determining the extent of psychological impact after exposure to the public health crisis within one week of exposure (Zhang et al., 2014). The total IES-R score was divided into 0–17 (normal), 18–23 (PTSD like symptoms) and > 24 (diagnosis of PTSD). (Lee, Kang, Cho, Kim, and Park, 2018) Mental health status was measured using the Depression, Anxiety and Stress Scale (DASS-21) based on a tripartite model of psychopathology that comprise a general distress construct with distinct characteristics (Le et al., 2019). DASS has been demonstrated to be a reliable and valid measure in assessing mental health in the Chinese population (Ho et al., 2019; Quek et al., 2018). DASS was previously used in research related to SARS (McAlonan et al., 2007) and COVID-19 (Wang et al., 2020a,b). The sleep quality of respondents was measured using the Insomnia Severity Index (ISI) (Bastien et al., 2001). The total ISI score was divided into no clinically significant insomnia (0–7), subthreshold insomnia (8–14), moderately severe clinical insomnia (15–21) and severe clinical insomnia (22–28).

### 2.4. Statistical analysis

Descriptive statistics were used to summarize the variables, mean and standard deviation were used for continuous variables, while frequency and percentage were used for categorical variables. Inferential statistics, including independent sample *t*-test, and Pearson's Chi-square

**Table 1**  
Demographic characteristics, physical symptoms and physical health status of the study respondents with and with psychiatric illnesses.

	Psychiatric patients (n = 76)	Healthy controls (n = 109)	P
<b>Gender</b>			
Male	25 (32.9%)	41 (37.6%)	0.510
Female	51 (37.1%)	68 (62.4%)	
Mean age (SD)	32.8 (11.8)	33.1 (11.2)	0.876
<b>Education level</b>			
Primary school	1 (1.3%)	0 (0.0%)	< 0.001
Lower secondary school	7 (9.2%)	2 (1.8%)	
Upper secondary school	8 (10.5%)	6 (5.5%)	
Community college	26 (34.2%)	16 (14.7%)	
Undergraduate university degree	27 (35.5%)	67 (61.5%)	
Postgraduate university degree	7 (9.2%)	18 (16.5%)	
<b>Household size</b>			
1 Family member	7 (9.2%)	8 (7.3%)	0.947
2 Family members	17 (22.4%)	23 (21.1%)	
3–5 Family members	48 (63.5%)	73 (67.0%)	
6 or above family members	4 (5.3%)	5 (4.6%)	
<b>†Recent physical symptom in the past 14 days</b>			
No physical symptom	53 (69.7%)	103 (94.5%)	< 0.001
At least one of the physical symptoms	23 (30.3%)	6 (5.5%)	
<b>Self-reported physical health status</b>			
Poor or worse	7 (9.2%)	3 (2.8%)	< 0.001
No change	40 (52.6%)	31 (28.4%)	
Healthier or better	29 (38.2%)	75 (68.8%)	
<b>Psychiatric Diagnosis</b>			
F32/F33 Major Depressive Disorder	12 (16%)	N/A	N/A
F41 Other anxiety disorders	19 (25%)		
F41.8 Mixed anxiety and depressive disorder	45 (59%)		

† Recent physical symptom in the past 14 days include fever, chills, headache, myalgia, cough, difficulty in breathing, dizziness, coryza, sore throat, nausea, vomiting or diarrhoea.

test, were used to examine if there was any difference in the outcome variables between the psychiatric patient and healthy subject groups. Multiple linear regression with a backward selection method was used to examine the association between the outcome variables and the two groups of subjects as well as the demographic variables. All the analyses were conducted using IBM SPSS Statistics 22, and the level of significance was set at 5%.

### 3. Results

#### 3.1. Demographic characteristics of respondents with and without psychiatric illnesses

Table 1 shows the demographic characteristics of the study respondents with and without psychiatric illnesses. Of the 666 psychiatric patients who were approached, 76 completed the survey. The total response rate was 11.3%. Of the 130 healthy controls who were approached, 109 completed the survey. The total response rate was 83.8%. The respondents consisted of 76 psychiatric patients and 109 healthy controls who were age and gender matched. The majority of respondents from both groups were women, staying in a household with 3 to 5 family members with a mean age of 32 years. There was a significantly higher proportion of healthy controls who held an undergraduate degree (61.5%) as compared to psychiatric patients (35.5%) ( $p < 0.001$ ). Significantly more psychiatric patients reported physical symptoms similar to COVID-19 (30.3% vs 5.5%) and poor or

**Table 2**  
IES-R, DASS-21 and ISI scores of the study respondents with and without psychiatric illnesses.

	Psychiatric patients (n = 76)	Healthy controls (n = 109)	P
<b>Impact of Event Scale – Revised (IES-R)</b>			
Mean IES-R score	17.7 (14.2)	11.3 (10.1)	0.001
Presence of PTSD like symptoms			0.025
No PTSD like symptoms (17 or below)	43 (56.6%)	79 (72.5%)	
PTSD (18 or above)	33 (43.4%)	30 (27.5%)	
Presence of diagnosis PTSD			0.003
No diagnosis of PTSD (23 or below)	52 (68.4%)	94 (86.2%)	
Diagnosis of PTSD (24 or above)	24 (31.6%)	15 (13.8%)	
<b>Depression, Anxiety, Stress and Stress Scale-21 (DASS-21)</b>			
Mean DASS-21 Anxiety score	6.6 (9.0)	1.5 (2.7)	< 0.001
DASS-21 (Anxiety)			< 0.001
No (0–7)	56 (73.7%)	102 (93.6%)	
Mild (8–9)	2 (2.6%)	4 (3.7%)	
Moderate (10–14)	7 (9.2%)	2 (1.8%)	
Severe (15–19)	3 (3.9%)	1 (0.9%)	
Extremely Severe (20+)	8 (10.5%)	0 (0.0%)	
Mean DASS-21 Depression score	8.3 (10.3)	2.2 (3.5)	< 0.001
DASS-21 (Depression)			< 0.001
No (0–9)	50 (65.8%)	107 (98.2%)	
Mild (10–13)	9 (11.8%)	1 (0.9%)	
Moderate (14–20)	7 (9.2%)	0 (0.0%)	
Severe (21–27)	4 (5.3%)	1 (0.9%)	
Extremely Severe (28+)	6 (7.9%)	0 (0.0%)	
Mean DASS-21 Stress score	8.0 (9.8)	2.7 (4.2)	< 0.001
DASS-21 (Stress)			< 0.001
No (0–14)	61 (80.3%)	108 (99.1%)	
Mild (15–18)	2 (2.6%)	0 (0.0%)	
Moderate (19–25)	7 (9.2%)	1 (0.9%)	
Severe (26–33)	3 (3.9%)	0 (0.0%)	
Extremely Severe (34+)	3 (3.9%)	0 (0.0%)	
<b>Insomnia Severity Index (ISI)</b>			
Mean ISI score	10.1 (7.16)	4.63 (4.04)	< 0.001
No clinically significant insomnia (0–7)	35 (46.1%)	81 (74.3%)	< 0.001
Subthreshold insomnia (8–14)	20 (26.3%)	25 (22.9%)	
Moderately severe clinical insomnia (15–21)	15 (19.7%)	2 (1.8%)	
Severe clinical insomnia	5 (7.9%)	1 (0.9%)	

worse physical health (9.2% vs 2.8%) as compared to healthy controls ( $p < 0.001$ ). For psychiatric patients, majority of the respondents had F41.8 mixed anxiety and depressive disorder (59%), followed by F41 other anxiety disorders (25%) and F32, and F33 Major depressive disorder (16%).

#### 3.2. IES-R and DASS scores of respondents with and without psychiatric illnesses

Table 2 shows the IES-R, DASS-21 and ISI scores of the study respondents. The mean-IES-R score of psychiatric patients ( $17.7 \pm 14.2$ ) was significantly higher than healthy controls ( $11.3 \pm 10.1$ ) ( $p < 0.001$ ). Thirty-three (43.4%) psychiatric patients and 30 (27.5%) healthy controls received a score of 18 or higher in keeping with clinically significant of PTSD-like symptoms. There were significantly more psychiatric patients reporting PTSD-like symptoms as compared to healthy controls ( $p = 0.025$ ). Twenty-four (31.6%) psychiatric patients and 15 (13.8%) healthy controls received a score of 24 or higher, indicating the fulfilment of diagnostic criteria for PTSD. There were

significantly more psychiatric patients fulfilling the diagnostic criteria of PTSD as compared to healthy controls ( $p = 0.03$ ).

The mean DASS-21 anxiety score of psychiatric patients ( $6.6 \pm 9.0$ ) was significantly higher than healthy controls ( $1.5 \pm 2.7$ ) ( $p < 0.001$ ). Eighteen (23.6%) psychiatric patients and 3 (2.7%) healthy controls received a score of 10 or higher on the anxiety subscale, indicating the presence of moderate to severe anxiety symptoms. There were significantly more psychiatric patients reporting anxiety symptoms as compared to healthy controls ( $p < 0.001$ ).

The mean DASS-21 depression score of psychiatric patients ( $8.3 \pm 10.3$ ) was significantly higher than healthy controls ( $2.2 \pm 3.5$ ) ( $p < 0.001$ ). Seventeen (22.4%) psychiatric patients and 1 (0.9%) healthy control received a score of 14 or higher on the depression subscale, indicating the presence of moderate to severe depressive symptoms. There were significantly more psychiatric patients reporting depressive symptoms as compared to healthy controls ( $p < 0.001$ ).

The mean DASS-21 stress score of psychiatric patients ( $8.0 \pm 9.8$ ) was significantly higher than healthy controls ( $2.7 \pm 4.2$ ) ( $p < 0.001$ ). Thirteen (17%) psychiatric patients and 1 (0.9%) healthy control received a score of 19 or higher on the stress subscale, indicating the presence of moderate to severe stress symptoms. There were significantly more psychiatric patients reporting stress symptoms as compared to healthy controls ( $p < 0.001$ ).

The mean ISI score of psychiatric patients ( $10.1 \pm 7.16$ ) was significantly higher than healthy controls ( $4.63 \pm 4.04$ ) ( $p < 0.001$ ). Twenty (27.6%) psychiatric patients and 1 (0.9%) healthy control receive a score of 15 or higher, indicating the presence of moderately severe to severe clinical insomnia. There were significantly more psychiatric patients reporting moderately severe to severe clinical insomnia as compared to healthy controls ( $p < 0.001$ ).

### 3.3. Other psychiatric symptoms of respondents during the COVID-19 epidemic

Table 3 shows other psychiatric symptoms reported by respondents during the COVID-19 epidemic. Twenty-two (29%) psychiatric patients and 5 (4.6%) healthy controls reported moderate to severe worries about their physical health. There were significantly more psychiatric patients reporting moderate to severe worries about their physical health as compared to healthy controls ( $p < 0.001$ ). Sixteen (21%) psychiatric patients and 1 (0.9%) healthy control reported moderate to severe anger and impulsivity. There were significantly more psychiatric patients reporting moderate to severe anger and impulsivity as compared to healthy controls ( $p < 0.001$ ). Nine (11.8%) psychiatric patients and 1 (0.9%) healthy control reported moderate to severe suicidal ideation. There were no significant differences in the rate of discrimination, auditory hallucination, paranoid idea, alcohol use, and intention to harm others between psychiatric patients and healthy controls ( $p > 0.05$ ).

### 3.4. Factors associated with the psychological impact of respondents during the COVID-19 epidemic

Table 4 shows the results of linear regression analysis between psychological impact and self-reported health status and history of psychiatric illnesses in all respondents, with adjustment to demographic factors. Respondents who reported recent physical symptoms in the past fourteen days were significantly associated with higher mean DASS anxiety subscale scores ( $B = 3.956$ , 95% CI: 1.438–6.475,  $p = 0.002$ ) and DASS stress subscale scores ( $B = 3.352$ , 95% CI: 0.368–6.335,  $p = 0.028$ ) as compared to respondents who did not report any recent physical symptom in the past 14 days. Respondents who reported no change, poor or worse physical health status was significantly more likely to endorse higher mean IES-R scores ( $B = 6.245$ , 95% CI: 2.677–9.813,  $p = 0.001$ ), DASS depression subscale scores ( $B = 2.931$ ,

**Table 3**

Other psychiatric symptoms reported by respondents during the COVID-19 epidemic.

	Psychiatric patients (76)	Healthy controls (109)	P
Worries about own physical health			< 0.001
No worry	34 (44.7%)	55 (50.5%)	
Mild worry	20 (26.3%)	49 (45.0%)	
Moderate	12 (15.8%)	4 (3.7%)	
Serious	6 (7.9%)	0 (0.0%)	
Very serious	4 (5.3%)	1 (0.9%)	
Experience of discrimination during COVID epidemic			0.231
No discrimination			
Mild discrimination	74 (97.4%)	104 (95.4%)	
Moderate discrimination	1 (1.3%)	5 (4.6%)	
Serious discrimination	1 (1.3%)	0 (0.0%)	
Very serious discrimination	0 (0.0%)	0 (0.0%)	
Auditory hallucination	0 (0.0%)	0 (0.0%)	0.208
No auditory hallucination	71 (93.4%)	106 (97.2%)	
Mild auditory hallucination	5 (6.6%)	3 (2.8%)	
Moderate auditory hallucination	0 (0.0%)	0 (0.0%)	
Serious auditory hallucination	0 (0.0%)	0 (0.0%)	
Very serious auditory hallucination	0 (0.0%)	0 (0.0%)	
Hallucination			
Paranoid idea			0.053
No paranoid idea	72 (94.7%)	109 (100.0%)	
Mild paranoid idea	2 (2.6%)	0 (0.0%)	
Moderate paranoid idea	2 (2.6%)	0 (0.0%)	
Serious paranoid idea	0 (0.0%)	0 (0.0%)	
Very serious paranoid idea	0 (0.0%)	0 (0.0%)	
Anger and impulsivity			< 0.001
No anger and impulsivity	49 (64.5%)	99 (90.8%)	
Mild anger and impulsivity	11 (14.5%)	9 (8.3%)	
Moderate anger and impulsivity	10 (13.2%)	1 (0.9%)	
Serious anger and impulsivity	3 (3.9%)	0 (0.0%)	
Very serious anger and impulsivity	3 (3.9%)	0 (0.0%)	
Alcohol use			0.345
No alcohol use	74 (97.4%)	103 (94.5%)	
Mild alcohol use	2 (2.6%)	6 (5.5%)	
Moderate alcohol use	0 (0.0%)	0 (0.0%)	
Serious alcohol use	0 (0.0%)	0 (0.0%)	
Very serious alcohol use	0 (0.0%)	0 (0.0%)	
Suicidal ideation			0.003
No suicidal ideation	64 (84.2%)	108 (99.1%)	
Mild suicidal ideation	3 (3.9%)	0 (0.0%)	
Moderate suicidal ideation	5 (6.6%)	0 (0.0%)	
Serious suicidal ideation	3 (3.9%)	1 (0.9%)	
Very serious suicidal ideation	1 (1.3%)	0 (0.0%)	
The intention of hurting others			0.157
No intention of hurting others	70 (92.1%)	107 (98.2%)	
The mild intention of hurting others	3 (3.9%)	2 (1.8%)	
The moderate intention of hurting others	2 (2.6%)	0 (0.0%)	
The serious intention of hurting others	1 (1.3%)	0 (0.0%)	
The very serious intention of hurting others	0 (0.0%)	0 (0.0%)	

95% CI: 1.105–4.756,  $p = 0.002$ ), DASS anxiety subscale scores ( $B = 4.202$ , 95% CI: 2.093–6.312,  $p < 0.001$ ), DASS stress subscale scores ( $B = 3.766$ , 95% CI: 1.604–5.929,  $p = 0.001$ ), and ISI score ( $B = 3.545$ , 95% CI: 1.923–5.168,  $p < 0.001$ ) as compared to respondents who reported healthier or better health. Respondents with psychiatric illnesses were significantly more likely to endorse higher mean IES-R scores ( $B = 4.450$ , 95% CI: 0.852–8.048,  $p = 0.016$ ), DASS depression subscale scores ( $B = 3.223$ , 95% CI: 1.385–5.061,  $p = 0.001$ ), mean DASS anxiety subscale scores ( $B = 4.871$ , 95% CI: 2.74–6.998,  $p < 0.001$ ), mean DASS stress subscale scores ( $B = 3.311$ ,

**Table 4**Multiple Linear regression analysis<sup>a</sup> between psychological impact and self-reported health status and history of psychiatric illnesses in all respondents (n = 185).

	IES-R score	DASS anxiety subscale score	DASS depression subscale score	DASS stress subscale score	ISI score
Recent physical symptom in the past 14 days					
No physical symptom	Non-significant	Reference	Non-significant	Reference	Non-significant
†At least one of the physical symptoms		3.956 (1.438, 6.475) p = 0.002		3.352 (0.368, 6.335) p = 0.028	
Self-reported physical health status					
Healthier or better	Reference group				
No change, poor or worse	6.245 (2.677, 9.813) p = 0.001	2.931 (1.105, 4.756) p = 0.002	4.202 (2.093, 6.312) p < 0.001	3.766 (1.604, 5.929) p = 0.001	3.545 (1.923, 5.168) p < 0.001
Psychiatric illnesses					
No psychiatric illnesses	Reference group				
With psychiatric illnesses	4.450 (0.852, 8.048) p = 0.016	3.223 (1.385, 5.061) p = 0.001	4.871 (2.743, 6.998) p < 0.001	3.311 (1.133, 5.488) p = 0.003	4.386 (2.749, 6.022) p < 0.001

<sup>†</sup>Recent physical symptoms in the past 14 days include fever, chills, headache, myalgia, cough, difficulty in breathing, dizziness, coryza, sore throat, nausea, vomiting or diarrhoea.

<sup>a</sup>All the regressions included age, gender, education level and household size, recent physical symptom in the past 14 days, self-reported physical health status, and psychiatric diagnosis as independent variables and backward selection method was then applied to remove all insignificant variables.

95% CI: 1.133–5.488,  $p = 0.003$ ), and ISI scores ( $B = 4.386$ , 95% CI: 2.749–6.022,  $p < 0.001$ ) as compared to respondents without psychiatric illnesses. Other demographic factors inclusive of age, gender, education level, and household size were not associated with differences in mean IES-R, DASS depression subscale, DASS anxiety subscale, DASS stress subscale, and ISI scores ( $p > 0.05$ ).

#### 4. Discussion

The main results of the present study indicate that during the peak of the COVID-19 epidemic with strict lockdown measures, psychiatric patients scored significantly higher on the total IES-R, DASS-21 anxiety, depression, and stress subscales and, total ISI scores. More than one-quarter of psychiatric patients reported PTSD-like symptoms and moderate to severe insomnia. Psychiatric patients were significantly more likely to report worries about their physical health, anger, impulsivity, and suicidal ideation. Respondents who reported no change, poor or worse physical health status and had psychiatric illnesses were significantly more likely to endorse higher mean IES-R, DASS depression, anxiety, and stress subscale, and ISI scores. Our findings rejected the original null hypothesis that there were no differences between the levels of depression, anxiety and stress and psychological impact encountered by people with and without psychiatric illnesses during the peak of COVID-19 epidemic with strict quarantine measures. To our best knowledge, this is the first study assessing the psychological impact on psychiatric patients and healthy controls during the peak of the COVID-19 epidemic when strict lockdown measures were in place for the entire city. Our findings identify potential targets of assessment and care for psychiatric patients as part of the new immunopsychiatry service during a pandemic. Our results can be used as a reference for mental health professionals and authorities for a future outbreak of infectious disease.

The COVID-19 epidemic is highly contagious and has caused large-scale lockdown worldwide. This epidemic has resulted in relatively greater psychological distress in psychiatric patients. From the viewpoints of immunopsychiatry service, psychiatric patients were more likely to report moderate to severe worries about their physical health due to the concern that they might have unknowingly contracted the virus and perhaps less effective coping strategies (Chua et al., 2004; Colizzi et al., 2020). As a result, immunopsychiatry service should offer point-of-care test for the detection of COVID-19 and negative findings can offer reassurance to psychiatric patients. Contributing factors to worsening mental health were likely delays in delivery of psychotropic medications, lack of access to primary care or outpatient clinics, increased financial difficulty, personal concern of contracting COVID-19,

long duration of staying at home as well as more impoverished living conditions due to shortage of supplies in the weeks following the outbreak. These changes in circumstances might lead to feelings of hopelessness and increased suicidal ideation among psychiatric patients.

People with psychiatric illnesses were significantly more likely to endorse higher levels of PTSD, depression, anxiety, stress, and insomnia scores. Psychiatric patients might encounter a reduction in mental health services during the COVID-19 epidemic. Multiple factors caused a reduction in service. First, immediate mental health care needs of psychiatric patients were a lower priority when the number of COVID-19 cases rose sharply in the city. Second, psychiatric patients were encouraged not to visit the hospital as health services were devoted to managing terminally ill patients and suspected or confirmed cases of COVID-19. Third, the lockdown measures made it difficult for patients to see psychiatrists and other mental health care providers due to insufficient healthcare resources along with fear of contracting COVID-19 in hospitals which managed patients infected by COVID-19.

Our findings emphasise the need for a new immunopsychiatry service during COVID-19 pandemic to disseminate management plans with psychiatric patients via telepsychiatry due to lockdown measures, including people who have not hitherto contracted COVID-19. After the COVID-19 epidemic, mental health preparedness and anticipation of future outbreaks will lead to an increased awareness of the needs of psychiatric patients and contingency plans to be put in place. Telepsychiatry emergency services or hotline should be made available to patients with intense suicidal ideation. Improved access to telepsychiatry services, home delivery of psychotropic medications, online psychiatric first-aid resources, and infectious disease outbreak preparedness play a pivotal role in minimising the severity of psychiatric symptoms experienced by psychiatric patients. As depression and stress are associated with an increase of pro-inflammatory cytokines including Interleukin-1 beta (IL-1 $\beta$ ) (Lu et al., 2017), Interleukin-6 (IL-6) (Liu et al., 2012), Tumor Necrosis Factor- $\alpha$  (TNF- $\alpha$ ) (Osimo et al., 2020) and C-reactive protein (CRP) (Ng et al., 2018), future immunopsychiatry service and research should monitor the relationship between levels of pro-inflammatory cytokines and depression in psychiatric patients during the pandemic. Similarly, PTSD is associated with enhanced interleukin-6 response to mental stress (Lima et al., 2019). If pro-inflammatory cytokines were found to be increased in psychiatric patients during lockdown, further research is required to evaluate pharmacological intervention (Lee et al., 2018a,b) and non-pharmacological intervention (e.g. physical activity) to reduce pro-inflammatory cytokines (Simpson and Katsanis, 2020).

Self-reported poorer or worse physical health status was significantly and negatively associated with higher levels of PTSD,

depression, anxiety, stress, and insomnia scores. During the COVID-19 pandemic, the general public was found to spend more time at home (Wang et al., 2020a,b). Telepsychiatry and smartphone-based behaviour therapy should focus on relaxation exercises to counteract anxiety, PTSD-like symptoms, anger, and irritability. Sleep hygiene can improve sleep quality and circadian rhythm as part of the psychoneuroimmunity preventive strategies (Kim and Su, 2020). Activity scheduling (e.g., home-based exercise) can improve physical health status in the home environment (Zhang et al., 2015). Further research is required to evaluate the effectiveness of these psychoneuroimmunity preventive strategies to enhance resilience (Ho et al., 2020). Based on our findings, psychiatric patients expressed significantly higher levels of worries about their physical health. Telepsychiatry and smartphone-based cognitive therapy can challenge cognitive biases where psychiatric patients tend to overestimate the risk of contracting from COVID-19 or underestimate their physical health status (Zhang and Ho, 2017)

In this study, there are several negative findings between people with and without psychiatric illnesses that require further interpretation. Previous studies have shown widespread discrimination against people with psychiatric illnesses in China (Zhang et al., 2019). In this study, respondents with psychiatric illnesses did not experience additional discrimination during the COVID-19 epidemic. One possible explanation was that society held more negative views towards COVID-19 as compared to psychiatric illnesses during an outbreak of a life-threatening infection. Respondents with psychiatric illnesses did not show an increase in alcohol intake as compared to healthy control groups. This observation is different from the previous study, which reported the increase in alcohol intoxication and abuse after natural disasters (e.g., earthquake) (Tembe et al., 2019). As the government implemented outing restriction during the COVID-19 epidemic for all citizens, people with and without psychiatric illnesses did not have frequent access to purchase alcohol from local supermarkets. Also, entertainment venues, bars, and restaurants were ordered to cease operation and these measures further reduce alcohol intake of psychiatric patients and healthy controls. Levels of PTSD symptoms, depression, anxiety, stress, and insomnia were not related to educational level, age and gender, indicating that all sectors of the community were adversely affected.

There are several limitations in the present study. First, there are limitations in generalising the sample of psychiatric patients as they suffered from non-psychotic psychiatric disorders, which was due to a restricted sampling during COVID-19 epidemic with strict lockdown measures. Their capacity to complete an online questionnaire attested to the fact that the psychiatric patients were less severely ill. Second, we were not able to obtain biological samples such as levels of pro-inflammatory cytokines due to lockdown. Third, the sampling of this study was voluntary and conducted online when strict lockdown measures were in place. Psychiatric patients who did not have access to emails and the Internet were excluded and resulted in a low response rate. Fourth, this was a cross-sectional study, and we could not demonstrate the cause and effect relationship between self-perceived health status, underlying psychiatric condition, and psychological impact. Additionally, this study was performed in only one hospital and might not reflect trends seen throughout China. Despite these limitations, this is the first study that examined the psychological impact on people with and without psychiatric illnesses in a city severely affected by the COVID-19 epidemic with strict lockdown measures.

## 5. Conclusion

To our knowledge, this is the first cross-sectional study that compared the prevalence of psychiatric symptoms between people with and without psychiatric illnesses during the COVID-19 pandemic. Our findings will serve as a reference for mental health professionals and institutions in other countries as the COVID-19 pandemic is ongoing.

The results of this study suggest that psychiatric patients were at a higher risk of displaying higher levels of symptoms of PTSD, depression, anxiety, stress and insomnia, worries about physical health, anger and irritability and suicidal ideation as compared to healthy controls. From immunopsychiatry service viewpoints, there should be more awareness regarding psychiatric patients as targets for care with continuous psychiatric intervention during the pandemic of life-threatening infectious diseases.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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