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Prevalence and predictors of post-traumatic stress disorder in patients with cured coronavirus disease 2019 (COVID-19) one month post-discharge

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) can place an immense psychological strain on the infected patient. The psychological distress can linger after the initial recovery from the infection.

Objective: This study aimed to evaluate the prevalence and predictors of provisional post-traumatic stress disorder (PTSD) in patients with cured COVID-2019.

Methods: The baseline survey was conducted from 10 to 25 February 2020 in patients with COVID-19 in a designated hospital. Demographic and clinical characteristics were acquired, and depression and anxiety levels were assessed, using the 9-item Patient Health Questionnaire and 7-item Generalized Anxiety Disorder scale, respectively. A follow-up survey was conducted 1 month post-discharge. PTSD symptoms were measured by the Impact of Event Scale-6 (IES-6) and patients' perception of supportive care during hospitalization was investigated using a self-developed questionnaire.

Results: In total, 114 patients completed both the baseline and follow-up surveys. Of these, 41 (36.0%) met the cut-off score for provisional PTSD diagnosis according to the IES-6. Female gender [odds ratio (OR) = 4.69, 95% confidence interval (CI) 1.54–14.37], educational level of high school or below (OR = 15.49, 95% CI 1.13–212.71), higher anxiety levels (OR = 1.34, 95% CI 1.12–1.61) and lower perceptions of emotional support during hospitalization (OR = 0.41, 95% CI 0.17–0.96) predicted a higher risk for provisional PTSD.

Conclusions: PTSD is commonly seen in patients with COVID-19 1 month post-discharge. Female patients, and patients with lower educational levels, higher anxiety levels and lower perceptions of emotional support during hospitalization may be more likely to develop PTSD in the near future. Enhancing emotional support during hospitalization could help to prevent PTSD in patients with COVID-19.

HIGHLIGHTS
• More than one-third of patients met the diagnostic criteria of probable PTSD 1 month post-discharge.
• Providing timely emotional support during hospitalization may be one of the key measures for preventing PTSD in patients with COVID-19.

Prevalencia y predictores de TEPT en pacientes recuperados de COVID-19 un mes después del alta

Antecedentes: El COVID-19 ha supuesto una inmensa carga psicológica para el paciente infectado. El malestar psicológico puede persistir aún después de la recuperación inicial de la infección.

Objetivos: Este estudio tuvo como objetivo evaluar la prevalencia y los factores predictores del trastorno de estrés postraumático (TEPT) provisional en pacientes recuperados de COVID-2019.

Métodos: El cuestionario inicial se realizó en pacientes con el COVID-19 desde el 10 de febrero del 2020 hasta el 25 de febrero del 2020 en un hospital designado. Se consideraron las variables demográficas y clínicas, además, se evaluaron los niveles de depresión y ansiedad mediante el cuestionario de salud del paciente de 9 elementos y el cuestionario del trastorno de ansiedad generalizada de 7 elementos, respectivamente. Un cuestionario de seguimiento fue realizado un mes después del alta. Los síntomas de TEPT fueron medidos por el Cuestionario de Eventos de Impacto 6 (IES-6 por sus siglas en ingles) y el nivel de percepción de los pacientes sobre el cuidado de soporte durante la hospitalización fue investigado utilizando un cuestionario auto-administrado.

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Supplemental data for this article can be accessed here.

Resultados: Ciento catorce pacientes completaron tanto el cuestionario inicial como el de seguimiento. Cuarenta y un (36.0%) pacientes cumplieron con el punto de corte para el diagnóstico provisional de TEPT según el IES-6. El sexo femenino (OR = 4.69, 95% CI: 1.54-14.37), un nivel de educación secundaria o inferior (OR = 15.49, 95% CI: 1.13-212.71), niveles elevados de ansiedad (OR = 1.34, 95% CI: 1.12-1.61) y una menor percepción de soporte emocional durante la hospitalización (OR = 0.41, 95% CI: 0.17-0.96) fueron factores predictores de riesgo elevado para el desarrollo provisional de TEPT.
Conclusiones: El TEPT es observado con frecuencia en pacientes con COVID-19 un mes después del alta. Las pacientes de sexo femenino, los pacientes con un nivel de educación bajo, los pacientes con un nivel elevado de ansiedad y una menor percepción de apoyo emocional durante la hospitalización podrían tener mayor probabilidad de desarrollar TEPT en el futuro cercano. El reforzamiento del apoyo emocional durante la hospitalización podría ayudar a prevenir el TEPT en pacientes con COVID-19.

新型冠状病毒肺炎患者 (COVID-19) 出院一个月后创伤后应激障碍的患病率和预测因素

背景: COVID-19对受感染的患者造成了极大的心理压力, 最初的感染恢复后, 这种心理困扰可能会持续。
目的: 本研究旨在评估COVID-2019出院患者中创伤后应激障碍 (PTSD) 的患病率及其预测因素。
方法: 于2020年2月10日至2020年2月25日在定点医院对 COVID-19 患者进行基线调查, 包括人口学和临床特征, 同时采用9项患者健康问卷和广泛性焦虑障碍量表评估患者住院期间的抑郁焦虑程度。出院一个月后进行随访调查, 采用6项事件影响量表评估创伤后应激障碍症状, 并采用自编问卷调查患者在住院期间对医务人员支持性护理的认知。
结果: 114例患者完成了基线调查和随访调查。41例患者 (36.0%) 达到 PTSD 诊断的临界值。女性 (OR = 4.69, 95% CI: 1.54-14.37), 高中及以下文化程度(OR = 15.49, 95% CI: 1.13-212.71), 住院期间较高的焦虑水平 (OR = 1.34, 95% CI: 1.12-1.61) 和住院期间较低的情感支持认知 (OR = 0.41, 95% CI: 0.17-0.96) 预示着PTSD的高风险。
结论: COVID-19患者出院后患创伤后应激障碍比例较高。女性, 文化程度较低, 住院期间的较高焦虑状态以及感受到较低情感支持的患者, 更有可能在近期内发展为PTSD。在住院期间加强情感支持可能有助于预防 COVID-19 患者发生 PTSD。

1. Introduction

In December 2019, the coronavirus disease 2019 (COVID-19) epidemic first broke out in Wuhan City, Hubei Province, China (Wang, Horby, Hayden, & Gao, 2020a). Since then, the virus has spread rapidly around the whole globe (WHO, 2020). In China, through the arduous anti-epidemic campaign led by the government, the epidemic has effectively been brought under control. However, the infection has had an adverse impact on the physical and mental health of patients with COVID-19. Based on the studies and experience of several affected countries and regions, many people have suffered from COVID-19-related mental and psychological problems, including post-traumatic stress disorder (PTSD) (Duan et al., 2020; Epstein, Andrawis, Lipsky, Ziad, & Matan, 2020; Holmes et al., 2020; Hu et al., 2020; Vindegaard & Benros, 2020). Some patients with COVID-19 may develop acute stress reactions due to the crisis and the symptoms may persist even after recovery from the infection, deteriorating into chronic PTSD (Dutheil, Mondillon, & Navel, 2020; Xiao, Luo, & Xiao, 2020). However, little is known about the prevalence and related influencing factors of PTSD in COVID-19 patients after discharge.

Previous meta-analysis revealed that the point prevalence of PTSD in survivors of severe acute respiratory syndrome (SARS) was 32.2% during the post-infection stage (Rogers et al., 2020). For Ebola virus disease, 21% of survivors showed post-traumatic symptoms 1 month post-discharge (Hugo et al., 2015). More recently, studies have investigated PTSD symptoms and related risk factors in healthcare workers, quarantined citizens and the general public during the COVID-19 pandemic (Chew et al., 2020; Lai et al., 2020; Liu et al., 2020; Tang et al., 2020; Wang et al., 2020b). However, the pandemic may leave an even stronger scar on the mental health of patients who have lost their good physical health. Even after patients have recovered from the infection, the traumatic event may cause psychological distress in the long term (Ji et al., 2017; Kapfhammer, Rothenhausler, Krauseneck, Stoll, & Schelling, 2004; Lee et al., 2007; Lettinga et al., 2002). Yet, PTSD symptoms remain to be investigated in patients who have recovered from COVID-19 infection.

In China, the PTSD symptoms related to COVID-19 in the general public decreased as their perceived risks of contracting the virus reduced over time (Lai et al., 2020). However, in survivors of COVID-19, factors including long-term quarantine, residual respiratory symptoms, potential neurological impairments, economic burden and social stigmatization can induce and promote PTSD symptoms (Boyraz & Legros, 2020; Brooks et al., 2020; Javakhishvili et al., 2020; Logie & Turan, 2020; Mak et al., 2010). One study measured PTSD symptoms in SARS survivors across 4 years and found that the point prevalence of PTSD remained high over time (Hong et al., 2009). Therefore, prevention of PTSD is of great importance in patients affected by COVID-19. For early intervention and

prevention of PTSD, there is a pressing need to identify PTSD and its related risk factors in patients during an early stage. Studies investigating SARS survivors and populations related to COVID-19 suggested that demographic and clinical information is associated with the severity of PTSD symptoms (Chew et al., 2020; Lai et al., 2020; Liu et al., 2020). Research has shown that some modifiable factors, especially supportive care during hospitalization, may be related to patients' future PTSD symptoms (Wendlandt et al., 2019).

To the best of our knowledge, no prior study has explored the prevalence and potential predictors for PTSD in patients with COVID-19 after discharge from a designated hospital. Therefore, the current study aimed to investigate the proportion of COVID-19 patients who screened positive for PTSD in a designated hospital in China. We also aimed to identify related risk factors for provisional PTSD in patients with cured COVID-19. Importantly, besides demographic and clinical characteristics, we investigated modifiable elements of supportive care during hospitalization that may be potential intervention targets for preventing patients from developing PTSD.

2. Methods

2.1. Participants

All patients with COVID-19 were recruited from the First Hospital of Changsha in Hunan, China. Patients aged under 18 years, diagnosed according to the Diagnostic and Treatment Plan for COVID-19 (China), and able to use mobile devices to complete the questionnaires were invited to participate in the study. The baseline survey was conducted in patients during their hospitalization from 10 to 25 February 2020. All patients were informed of relevant research information by trained nurses in the isolation wards before the online investigation. A follow-up survey was conducted 1 month after patients discharged from hospital, from 5 March to 30 April. The researchers briefly interviewed the patients on the telephone about their physical and mental health status, and patients were then invited to participate in the follow-up investigation.

This study was approved by the ethics committee of the First Hospital of Changsha. All subjects signed electronic informed consent before answering the online questionnaire surveys.

2.2. Measures

The online questionnaires consisted of the following information at baseline. (1) Demographic data, including age, gender (male = 1, female = 2), marital status (married = 1, unmarried or divorced = 2) and education (high school or below = 1, bachelor's

degree = 2, master's or above = 3). (2) Clinical characteristics, including comorbidities of physical illness (yes = 1, no = 2), comorbidities of mental disorders (yes = 1, no = 2), duration of hospitalization and severity of illness (mild = 1, severe case = 2). The severity of COVID-19 was defined by the attending physicians according to the Diagnostic and Treatment Plan for COVID-19 (China). Patients fulfilling one of the following criteria were defined as severe COVID-19 cases: (I) respiratory rate $\geq$ 30 breaths/min; (II) arterial oxygen saturation (SaO_2) < 93%; (III) arterial oxygen partial pressure/fractional inspired oxygen (PaO_2/FiO_2) < 300 mmHg; or (IV) fast progression on imaging findings (defined as $\geq$ 50% lung involvement on imaging within 48 h). (3) Assessments of depression and anxiety, using the 9-item Patient Health Questionnaire (PHQ-9) and the 7-item Generalized Anxiety Disorder scale (GAD-7), respectively (Tong, An, McGonigal, Park, & Zhou, 2016; Wang et al., 2014; Xiaoyan, Chunbo, Jie, Haisong, & Wenyuan, 2010). The Chinese versions of these two scales were shown to have good internal consistency and test–retest reliability (Tong et al., 2016; Wang et al., 2014; Xiaoyan et al., 2010). Each question in the PHQ-9 and GAD-7 has four options with a score of 0–3 (0 = 'not at all', 1 = 'several days', 2 = 'more than half the days', 3 = 'nearly every day'). The PHQ-9 ranges from 0 to 27 and the GAD-7 ranges from 0 to 21, with higher scores indicating a higher level of depression or anxiety.

At the follow-up survey, the following questions and scales were included. (1) Assessments for supportive care elements during hospitalization, using the COVID-19 Supportive Care Questionnaire. The self-administered scale, developed by the authors, includes 10 items that retrospectively measure patients' perceptions of care and utilization of care during their hospitalization. The perceptions of both supportive care and self-care were suggested to be associated with individuals' mental health stress (Janda et al., 2008; Sommers-Spijkerman, Trompetter, Schreurs, & Bohlmeijer, 2018; Urbaniec, Collins, Denson, & Whitford, 2011). The 10 items could be grouped into the following domains: provision of information ('The healthcare workers provided me with detailed information of my treatment plan', 'The healthcare workers provided me with detailed descriptions of my health condition', 'When I had concerns, the medical staff listened to me and gave me timely feedback'), provision of care ('The hospital met my daily needs in time during my stay in the hospital', ' The medical staff met my treatment needs in time during my stay in the hospital'), provision of emotional support ('When I felt stressed or worried, the medical staff provided emotional support in time'), patient initiatives ('When I had concerns, I took the initiative to ask the medical staff', 'When I felt stressed or worried, I took the initiative to ask someone for

help') and patient self-care ('I kept a regular daily routine during quarantine, such as eating, exercising and sleeping on time', 'I talked with my loved ones or friends every day, such as talking about my troubles or sharing interesting things'). A Likert scale was used to measure the statements of agreement. Each question had five options with a score of 1–5 (1 = 'strongly disagree ', 2 = 'disagree', 3 = 'undecided', 4 = 'agree', 5 = 'strongly agree'). (2) Assessment of PTSD symptoms, using the Impact of Event Scale-6 (IES-6), derived from the Impact of Event Scale – Revised (IES-R) (Thoresen et al., 2010). The IES-6 has been applied in previous studies assessing post-traumatic stress reactions related to emerging infectious diseases and acute respiratory distress syndrome (Hosey et al., 2019; Jalloh et al., 2018). The scale briefly measures the PTSD symptoms during the past 7 days with six questions. Each question has five options with a score of 0–4 (0 = 'not at all', 1 = 'a little bit', 2 = 'moderately', 3 = 'quite a bit', 4 = 'extremely'). The cut-off score for provisional PTSD diagnosis was set at the mean item score of 1.75, which has been shown to have good sensitivity (0.88) and specificity (0.85) in screening for PTSD in acute respiratory distress syndrome survivors (Hosey et al., 2019). (3) Information about the isolation sites for 2 week clinical observation after discharge from the designated hospital, categorized as centralized isolation (i.e. in the designated hotel) or home isolation.

2.3. Statistical analysis

SPSS version 25.0 was used for analysis. The statistical significance was set at $p < 0.05$ (two-tailed). The normality of data distributions was identified by probability plots. Continuous variables were presented as mean and standard deviation or median and interquartile range (IQR), as appropriate. Categorical variables were presented as frequency and percentages in each category.

Predictors for provisional PTSD were first identified using univariate logistic regression analyses. A provisional PTSD diagnosis (cut-off score of 1.75 for IES-6) served as the outcome variable in the binary logistic model. Demographics (including age, gender, educational level, marriage), clinical characteristics (comorbidities of physical illness, comorbidities of mental disorders, duration of hospitalization and severity of illness), and scores on the COVID-19 Supportive Care Questionnaire were entered individually as potential independent variables in the univariate logistic regression models. These are independent variables that have been suggested to be associated with individuals' PTSD symptoms in previous studies (Chew et al., 2020; Liu et al., 2020; Sun et al., 2020; Wendlandt et al., 2019). Other potential predictors included isolation sites for the 2 week clinical observation after discharge. Factors that showed statistical significance were entered into a multivariate logistic

regression model to identify independent predictive factors for provisional PTSD related to COVID-19. Multicollinearity for the predictors was examined by the variance inflation factor (VIF) prior to the multivariate binary logistic regression analysis.

3. Results

3.1. Patient characteristics

In total, 206 patients with confirmed COVID-19 were eligible for inclusion during the baseline investigation. Of these, 163 consented and completed our survey. There were more severe cases in the non-responders (26 out of 43) than the responders (16 out of 163). The two groups did not differ in gender (22 female and 21 male) or age (median 41, range 31–53 years). During the follow-up survey, 114 patients agreed to be followed up. There were no significant differences in the baseline demographics and clinical characteristics between the responders and non-responders at the follow-up time-point (Supplemental Table 1). Of the 114 responders, the median age was 40 years old and 53.5% patients were male. There were 37 patients with physical comorbidities and five with psychiatric comorbidities. Eleven patients were classified as severe cases. The average length of stay in hospital was 17.4 days. The median scores on the PHQ-9 and GAD-7 were both 4 during hospitalization. After discharge, 59 patients chose to go to a designated hotel and 55 chose to go back home for the 2 week self-isolation. Baseline characteristics are presented in Table 1. Scores on the self-reported COVID-19 Supportive Care Questionnaire during follow-up are also provided in Table 1. Among the 10 items describing supportive care during hospitalization, the provision of care ('The hospital tried to meet my daily needs during my stay in the hospital', 'The medical staff met my treatment needs in time') achieved the highest mean score.

3.2. Provisional PTSD in patients post-discharge

IES-6 scores in patients with cured COVID-19 during follow-up are presented in Table 2. The mean score on the IES-6 was 1.72, with 'I thought about COVID-19 when I did not mean to' rated highest among the six items (1.96 ± 0.95). Among the 114 participants, 41 patients (36.0%) met the provisional PTSD diagnosis at the follow-up time-point.

3.3. Results of logistic regression analysis

Variables that showed significance in univariate logistic regression analyses were included in the multivariate logistic regression model, including age, gender, education, depression and anxiety levels, and three elements of supportive care during hospitalization (i.e. 'The hospital clearly informed me of my health condition',

Table 1. Characteristics of the study samples.

Participant characteristics	Total (n = 114)	With PTSD (n = 41)	Without PTSD (n = 73)	OR (95% CI)	p
Demographics					
Age (years)	40 (31.75–50.25)	46 (36.5–55.5)	39 (29.5–46)	1.03 (1.00–1.06)	0.047*
Gender					0.031*
Male	61 (53.5)	17 (41.5)	44 (60.3)	1	
Female	53 (46.5)	24 (58.5)	29 (39.7)	2.37 (1.08–5.19)	
Marital status					0.571
Unmarried or divorced	25 (21.9)	8 (19.5)	17 (23.3)	1	
Married	89 (78.1)	33 (80.5)	56 76.7)	0.43 (0.02–8.04)	
Education					
High school or below	40 (35.1)	19 (46.4)	21 (28.7)	9.95 (1.17–84.5)	0.035*
Bachelor's degree	62 (54.4)	21 (51.2)	41 (56.2)	5.63 (0.68–46.63)	0.109
Master's or above	12 (10.5)	1 (2.4)	11 (15.1)	1	
Clinical characteristics					
Comorbidity of physical disorder					0.263
Yes	37 (32.5)	16 (39.0)	21 (28.8)	1	
No	77 (67.5)	25 (61.0)	52 (71.2)	0.63 (0.28–1.41)	
Comorbidity of mental disorder					0.848
Yes	5 (4.4)	2 (4.9)	3 (4.1)	1	
No	109 (95.6)	39 (95.1)	70 (95.9)	0.84 (0.13–5.12)	
Duration of hospitalization (days)	17.4 ± 7.7	17.62 ± 7.99	17.10 ± 7.20		
Severity of pneumonia					0.728
Mild	103 (90.4)	38 (92.7)	65 (89.0)	1	
Severe	11 (9.6)	3 (7.3)	8 (11.0)	1.56 (0.39–6.23)	
Isolation site					0.760
Centralized isolation	59 (51.8)	22 (53.7)	37 (50.7)	1	
Home isolation	55 (48.2)	19 (46.3)	36 (49.3)	1.13 (0.52–2.24)	
Mental status during hospitalization					
PHQ-9	4 (1–7)	6 (3.5–16)	2 (1–6)	1.17 (1.08–1.28)	< 0.001
GAD-7	4 (1–7)	7 (4–13)	2 (0–6)	1.26 (1.14–1.40)	< 0.001
COVID-19 Supportive Care Questionnaire					
The healthcare workers provided me with detailed information of my treatment plan	3.03 ± 0.85	2.88 ± 0.68	3.11 ± 0.92	0.72 (0.46–1.41)	0.163
The healthcare workers provided me with detailed descriptions of my health condition	3.19 ± 0.73	3.05 ± 1.05	3.32 ± 0.71	0.51 (0.30–0.90)	0.019*
When I had questions, I took the initiative to ask the medical staff	3.31 ± 0.65	3.10 ± 0.74	3.42 ± 0.58	0.45 (0.25–0.84)	0.012*
When I had concerns, the medical staff listened to me and gave me timely feedback	3.26 ± 0.73	3.15 ± 0.69	3.33 ± 0.75	0.71 (0.42–1.21)	0.205
The hospital met my daily needs in time during my stay in the hospital	3.56 ± 0.53	3.54 ± 0.55	3.58 ± 0.53	0.61 (0.31–1.17)	0.134
The medical staff met my treatment needs in time during my stay in the hospital	3.50 ± 0.58	3.39 ± 0.63	3.56 ± 0.55	0.87 (0.43–1.79)	0.708
When I felt stressed or worried, I took the initiative to ask someone for help (including family members, medical staff, etc.)	3.02 ± 0.94	2.83 ± 0.95	3.12 ± 0.93	0.72 (0.48–1.08)	0.112
When I felt stressed or worried, the medical staff provided emotional support in time	3.11 ± 0.74	2.88 ± 0.71	3.25 ± 0.72	0.48 (0.28–0.85)	0.015*
I kept a regular daily routine during quarantine, such as eating, exercising and sleeping on time	3.24 ± 0.66	3.24 ± 0.70	3.23 ± 0.64	1.03 (0.57–1.84)	0.931
I talked with my loved ones or friends every day, such as talking about my troubles or sharing interesting things	3.29 ± 0.62	3.17 ± 0.63	3.36 ± 0.61	0.61 (0.33–1.15)	0.129

Note: Data are shown as median (interquartile range), n (%) or mean ± SD.

n, number of participants; PTSD, post-traumatic stress disorder; OR, odds ratio; CI, confidence interval; PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalized Anxiety Disorder scale; COVID-19, coronavirus disease 2019.

*p < 0.05.

Table 2. Scores on Impact of Event Scale-6 (IES-6) items.

Item	Score (mean ± SD)
1. I thought about COVID-19 when I did not mean to	1.96 ± 0.95
2. I felt watchful or on guard	1.52 ± 1.10
3. Other things kept making me think about COVID-19	1.44 ± 1.04
4. I was aware that I still had a lot of feelings about COVID-19, but I didn't deal with them	1.39 ± 1.06
5. I tried not to think about COVID-19	1.30 ± 1.01
6. I had trouble concentrating	0.98 ± 0.96
Mean	1.72 ± 1.03

Note: COVID-19, coronavirus disease 2019.

When I had questions, I took the initiative to ask the medical staff' and 'When I felt stressed or worried, the medical staff provided emotional support in time'). All the variables showed acceptable levels of collinearity, with VIFs ranging between 1 and 3. Therefore, all eight variables were included in the multivariate logistic regression model (Table 3). The results showed that being female [odds ratio (OR) = 4.69, 95% confidence interval (CI) 1.54–14.37], high school educational level

Table 3. Multiple logistic regression model of the predictors for post-traumatic stress disorder (PTSD) at follow-up.

Predictor	β	SE	Wald	p	OR (95% CI)
Age	−0.009	0.020	0.176	0.674	0.99 (0.95–1.03)
Gender	1.547	0.569	7.387	0.007**	4.69 (1.54–14.37)
Education					
High school or below	2.740	1.337	4.201	0.040*	15.49 (1.13–212.71)
Bachelor's degree	2.256	1.275	3.131	0.077	9.55 (0.78–116.21)
Master's or above			3.455	0.178	
PHQ-9	−0.040	0.079	0.252	0.615	0.96 (0.82–1.12)
GAD-7	0.296	0.093	10.154	0.001**	1.34 (1.12–1.61)
The healthcare workers provided me with detailed descriptions of my health condition	0.225	0.463	0.236	0.627	1.25 (0.51–3.1)
When I had questions, I took the initiative to ask the medical staff	−0.504	0.482	1.094	0.295	0.60 (0.24–1.55)
When I felt stressed or worried, the medical staff provided emotional support in time	−0.900	0.439	4.211	0.040*	0.41 (0.17–0.96)

Note: β, β-coefficient; SE, standard error; OR, odds ratio; CI, confidence interval for coefficient; PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalized Anxiety Disorder scale.
*$p < 0.05$, **$p < 0.01$.

or below (OR = 15.49, 95% CI 1.13–212.71), higher GAD-7 score during hospitalization (OR = 1.34, 95% CI 1.12–1.61) and lower perception of emotional support during hospitalization (OR = 0.41, 95% CI 0.17–0.96) independently predicted a higher risk of provisional PTSD at the follow-up time-point.

4. Discussion

To our knowledge, this is the first longitudinal study investigating the prevalence and predictors of provisional PTSD 1 month post-discharge in patients with cured COVID-19. We found that 41 (36.0%) patients met the provisional PTSD diagnosis 1 month post-discharge. Our findings also indicated that female patients and patients with lower educational levels were more likely to develop PTSD symptoms during the rehabilitation stage. In addition, a higher anxiety level during hospitalization was a strong predictors of provisional PTSD in the post-discharge stage. Last but not the least, the perception of a high level of emotional support from healthcare workers during hospitalization was a protective factor for provisional PTSD after discharge.

To date, there is limited information available on PTSD syndromes in patients with COVID-19. One study revealed that 96.2% (687 out of 714) of hospitalized patients experienced PTSD symptoms (Bo et al., 2020). Our study showed more than one-third of patients met the diagnostic criteria of probable PTSD 1 month post-discharge. The point prevalence was comparable with the previous point prevalences reported in a meta-analysis of studies involving patients with SARS during the post-illness stage (Rogers et al., 2020). The current study suggests that coronavirus infection is traumatizing for patients in an enduring manner.

Our study also found several factors that can predict a provisional PTSD diagnosis in patients. Demographics including female gender and lower educational level may increase the likelihood of PTSD onset. Female gender has previously been reported as a risk factor for PTSD symptoms in SARS survivors (Mak et al., 2010). Female gender was also suggested to be related to more post-traumatic stress symptoms in the general public in the areas hit hardest during the COVID-19 outbreak in China (Liu et al., 2020). The underlying psychological, genetic and hormonal factors in females may have contributed to a higher susceptibility to PTSD following the stressor (Olff, 2020; Verma, Balhara, & Gupta, 2011). Regarding educational level, meta-analyses found that a lower educational level was a predictor for adult PTSD induced by natural disasters (i.e. earthquakes) (Tang, Deng, Glik, Dong, & Zhang, 2017) as well as human-made disasters (i.e. combat exposure) (Xue et al., 2015). Educational level is related to socioeconomic status, social connections and health behaviour (Tang et al., 2017). Patients with a higher level of education may have better social support and conduct better coping methods, thus reducing the prevalence of PTSD (Braveman & Gottlieb, 2014). Besides demographics, we found that high anxiety levels in patients during hospitalization contributed to the prediction of provisional PTSD. Fear and worries have been identified as risk factors for PTSD symptoms during the COVID-19 pandemic (Tang et al., 2020). An earlier study also found that anxiety-related symptoms predicted subsequent PTSD symptom severity in survivors of traumatic physical injury after 6 months (Marshall, Miles, & Stewart, 2010). Patients with higher anxiety levels may have been more worried about their physical health and socioeconomic problems, which may have contributed to their PTSD symptoms related to COVID-19. Moreover, during the time when our study was conducted, the news that some patients had retested positive for the coronavirus after recovering had fuelled much fear among patients and the general public. Patients may be worried about being reinfected or transmitting the virus to others, which may have led to increased arousal and avoidance related to COVID-19.

Lastly, a supportive care element was identified in our study to be associated with a provisional PTSD diagnosis. Specifically, higher perceived emotional support from medical staff during hospitalization was related to a lower risk of provisional PTSD diagnosis 1 month post-discharge. Research has shown that providing adequate emotional support during clinical communication was a protective factor against developing depressive symptoms in patients with cancer (Fujimori et al., 2014). In addition, good emotional support for patients with chronic critical illness was negatively related to PTSD symptoms in their caregivers (Wendlandt et al., 2019). Considering the important role of emotional support in the development of future psychological distress, strategies to improve emotional support during hospitalization should be implemented.

There were nevertheless some limitations in the current study. First of all, the supportive care element was investigated retrospectively, at the follow-up timepoint. Therefore, recall bias could occur in the measure of patients' appraisals of previous supportive care. Also, the measure has not been well validated in Chinese samples. More studies need to sufficiently validate our current instrument. Secondly, although the IES-6 showed good accuracy in screening PTSD, a true diagnosis could not be obtained by the self-reported measures. Therefore, the point prevalence identified in the current study is only a rough estimation. Besides, our study did not measure PTSD during patients' hospitalization, which may have led to the provisional PTSD prevalence attributed to COVID-19 being overestimated, as premorbid PTSD was not controlled for. Thirdly, we were unable to include other clinical variables of the COVID-19 patients in our study. As inflammatory markers have been shown to be related to psychological distress in patients with COVID-19 (Hu et al., 2020), some biological markers during the acute infection stage may be helpful in predicting long-term adverse psychological events in cured patients. Future studies could collect more clinical features and laboratory data from patients to identify their predictive role in PTSD. Lastly, the current study was conducted in a single site. It is unknown whether the provisional PTSD prevalence in COVID-19 patients in our local district can be generalized to other districts. Further investigations in other patient populations are needed to confirm our results.

5. Conclusion

Female gender, lower educational level, higher anxiety level and lower perception of emotional support during hospitalization were predictors for provisional PTSD diagnosis in patients with COVID-19. Patients with such risk factors could be targeted for early prevention and intervention of COVID-19-related PTSD. Providing timely emotional support during hospitalization may be one of the key measures for preventing PTSD in patients with COVID-19. Brief mental health training for enhancing empathy could be embedded into the training programmes for hospital workers in the future (Ju et al., 2020). Besides, mental health professionals could be integrated into the core clinical team to form a multidisciplinary team to provide psychological care for affected patients. In addition, owing to the strict isolation measures inside wards and isolation sites, online mental health education, psychological assessments and psychological counselling should be actively provided for patients to address their mental health needs. Given the high provisional PTSD prevalence, sustained mental health support appears to be warranted in patients with COVID-19 during and after hospitalization.

Disclosure statement

No potential conflict of interest was reported by the authors.

Author contributions

Conception and design of the study: YMJ, YZ, JYL; acquisition and analysis of data: APY, KLS, YZ, MW, MH and YMJ; drafting the manuscript: YMJ, YZ and JYL; manuscript review and editing: WTC, BSL, JL and ML.

Author statement

This paper is new and neither the entire manuscript nor any part of its content has been published or accepted elsewhere. It is not in submission for any other journals. All authors have approved of the final version of this manuscript.

Data availability

According to the review board of the Changsha First Hospital, patient data cannot be shared at present.

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