Coronavirus Pandemic

Mental health outcomes and their influencing factors on patients with COVID-19 in the Fangcang shelter hospital in China

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Abstract

Introduction: Coronavirus disease 2019 (COVID-19) affects physical and mental health of patients. This study aimed to investigate the psychological distress, level of hope, and the role of families of patients with COVID-19 in the Fangcang shelter hospital (FSH) and explore potential influencing factors.

Methodology: We conducted an online observational cross-sectional study on 397 patients with mild to moderate COVID-19 from two FSH in Shanghai, China from 12 April to 16 May 2022. The questionnaire included demographic information, distress thermometer (DT), family adaptation, partnership, growth, affection, resolve (APGAR) index, and the Herth hope index (HHI).

Results: The patients reported symptoms of severe psychological distress (n = 109, 27.46%) and low levels of family care (n = 152, 38.29%). More than half of the patients (n = 244, 61.46%) exhibited high levels of hope, and around one-third of the patients (n = 151, 38.04%) reported moderate levels of hope. The study noted a significant negative correlation between the scores for psychological distress and APGAR and a significant positive correlation between the scores for APGAR and HHI ($p < 0.05$). The FSH living experience, diet, and symptoms of COVID-19 were closely associated with psychological distress among patients ($p < 0.05$).

Conclusions: Patients with COVID-19 living in the FSH reported high levels of symptoms of psychological distress and low levels of family care, but relatively high levels of hope. Health care workers should improve the living and eating conditions in the FSH, strengthen family support, and alleviate the COVID-19 related symptoms of patients.

Key words: COVID-19; patients; mental health; FSH.

Introduction

Coronavirus disease 2019 (COVID-19) first appeared in Wuhan, China. It is a type of acute respiratory infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus and is transmissible by respiratory droplets and close contact. The disease is highly infectious, mutates rapidly, and is frequently associated with various complications and serious threats to the lives of patients [1,2]. More than 80% of patients have a mild or moderate type of COVID-19 [3-5]. In China, the Fangcang shelter hospital (FSH) was set up for admission and treatment of COVID-19 patients [6-8]. The FSH is a novel public health concept that consists of movable modules, which may be real houses or temporary tents. They are set up for medical facilities, wards, and technical support units and are used for emergency and isolation treatments and clinical examinations [9,10]. They can be used for various emergency treatments. The FSH are a major innovative solution to the COVID-19 pandemic, because they provide adequate beds to accommodate confirmed

cases, which helps with China's fight against COVID-19 [11]. With the continued increase in the number of COVID-19 cases worldwide, several countries have established FSH to accommodate more patients. Therefore, data on psychological condition of COVID-19 patients in FSH in China may have implications for other countries [12].

However, patients in FSH lack privacy and security and are prone to panic, anxiety, depression, and other psychological problems due to its special treatment environment [13,14]. A survey in China concluded that the incidences of post-traumatic stress, anxiety, depression, insomnia, and perceived stress among patients with COVID-19 in FSH were 25.2%, 50.1%, 54.4%, 10.2%, and 39.7%, respectively [15]. Another survey in FSH also reported that the prevalence rates of anxiety and depression were 18.6% and 13.4%, respectively [16]. One study found that the overall sleep quality of the patients was acceptable and that the levels of cough, fear of disease progression, depression, and pain exposure at the time of entry to the FSH were the major factors that affected sleep quality [17]. COVID-19 is more likely to cause fear, anxiety, helplessness, and despair among patients than other diseases due to its unknown nature and variability [18,19]. In addition, shared infection among family members aggravates the fear and anxiety of patients [20].

Previous studies mainly focused on the psychological status of the patients in the FSH in Wuhan during the initial stage of the COVID-19 pandemic [21]. Two years later, in early March 2022, the COVID-19 pandemic spread rapidly in Shanghai. As of 21 May 2022, more than 600,000 COVID-19 cases and asymptomatic infections have been confirmed in Shanghai [22]. As of June 30, 2022, nearly 600 patients have died of COVID-19, which poses significant challenges to the healthcare systems of cities [23]. In order to control the spread of the pandemic, many FSHs have been established in Shanghai. These are mainly used to isolate patients with mild to moderate cases of infection [23]. With the progress of the anti- pandemic measures, the impact of COVID-19 on work and life also became severe [24].

This study aimed to investigate the psychological distress, level of hope, and family care of patients with COVID-19 in a FSH in Shanghai, China, during the post-pandemic era and their potential influencing factors. In addition, the study used binary logistic regression to analyze the relationship among psychological distress, level of hope, and family care and the independent factors of psychological distress. This study provided a potential strategy for evaluating mental health problems in patients with COVID-19 and may serve as an important reference to guide the promotion of hope and family support in this setting for patients with COVID-19.

Methodology
Study sample

This cross-sectional study used an online survey to assess the mental health problems of patients with COVID-19 in two Shanghai FSH (Shanghai New International Expo Center Shelter Hospital and Shanghai Jinshan Tianhua Road Shelter Hospital) from April 12 to May 16, 2022. The patients who were recruited by convenience sampling were invited to participate in the online survey through the "Questionnaire star" (www.wjx.cn) application. The inclusion criteria were as follows: positive COVID-19 test with mild and moderate symptoms, age ≥ 18 years and ability to live independently. The Biomedical Research Ethics Committee of West China Hospital of Sichuan University approved the study (approval number: 2020513). All the patients provided online informed consent prior to the study.

Demographic information

Demographic variables included gender, age, level of education, marital status, occupation, type of medical insurance, average personal income, registration of residency, with or without COVID-19 vaccination, number of days in the FSH, number of infections, whether the family members had isolated or not, number of times of isolation, presence of other chronic diseases, total number of drugs taken in addition to COVID-19 treatment drugs, living experience in the FSH, participation in sports in the FSH, diet in the FSH, living material guarantees in the FSH, and absence/presence of COVID-19 symptoms.

Chinese version of the distress thermometer (DT)

The DT is a self-rating instrument similar to a visual analog scale and contains 40 items that are used to screen the level of distress among patients, with range from 0 (no distress) to 10 (extreme distress) [25]. The Chinese version of the DT was used in this study. The patients were instructed to circle a number (i.e., 0-10) that best described the extent of distress they experienced in the previous week. The higher the DT score, the higher the degree of psychological distress. A score greater than or equal to 4 indicated severe psychological distress. Analysis of the Chinese version indicated that a cut-off score of 4/10 exhibited a

sensitivity rate of 0.80 and a specificity rate of 0.70 [25].

Chinese version of the Herth Hope Index (HHI)

The HHI comprises 12 items, that include three aspects, namely, temporality and future (T), positive readiness and expectancy (P), and interconnectedness (I). The participants rate each item using a four-point Likert scale with scores from 1 (strongly disagree) to 4 (strongly agree). The total possible scores range from 12 to 48 with high scores indicating high levels of hopefulness. Scores of 12-23, 24-35, and 36-48 indicate low, medium, and high levels of hopefulness, respectively. Previous research has empirically tested the psychometric properties of the HHI [26]. The internal consistencies of the Chinese version of the HHI for the test and retest were found to have alpha coefficients of 0.89 and 0.80 respectively [27].

Family APGAR index

Smilkstein *et al.* [28] developed the adaptation, partnership, growth, affection, resolve (APGAR) index and established its reliability and validity. It is primarily used to assess the family function of an individual. It consists of five items, which mainly reflect adaptability, partnership, growth, affection, and resolve. The total score ranges from 0 to 10; the higher the score, the higher the degree of family care. Scores ranging from 7 to 10, 4 to 6, and 0 to 3 indicate a good, moderate, and severe levels of family dysfunction, respectively [29]. In this study, the reliability coefficient of the internal consistency of the scale was 0.890 [30].

Data collection

The survey personnel included undergraduate and graduate students. During the implementation of the questionnaire survey, the investigators were trained uniformly to avoid measurement bias. The above-mentioned questionnaire was encoded into e-questionnaire templates using the "Questionnaire Star" application. Survey data were collected with the consent of the Shanghai FSH by disseminating links for the e-questionnaire through social media (WeChat). The participants clicked on the link and were automatically redirected to the questionnaire page. The researchers ensured that each questionnaire was filled out anonymously, personal information was not leaked, and an account could only be filled out once. Each part of the questionnaire had detailed instructions. If the respondents had any questions, the investigator provided online answers to questions that were unclear, and promptly checked the completeness and accuracy of the questionnaire. The time to complete the questionnaire was approximately 10-15 min. Two investigators systematically aggregated the valid results from the system by category into Excel tables for subsequent statistical analysis. A total of 400 questionnaires were collected, and three questionnaires with obvious errors were excluded. There were two questionnaires that reported an age of 2 and 3 years old, and another questionnaire that reported that the person had isolated 20 times. These responses were considered invalid and excluded. Therefore, 397 questionnaires were valid with an effective rate of 99.25%.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) 21.0 was used for data processing. The counted data were expressed as percentage (%), and the measured data were expressed as mean and standard deviation. Moreover, the study analyzed the relationship between the variables using Pearson's correlation analysis and used an independent sample t-test for comparison between two groups.

Table 1. Comparison of psychological distress, level of hope, and family function scores of patients with COVID-19 with different demographic characteristics and epidemic-related information in the FSH.

Variable	Total n (%)	APGAR			HHI			DT		
		M ± SD	t / F	p	M ± SD	t / F	p	M ± SD	t / F	p
Demography information										
Gender										
Male	199 (50.13)	7.25 ± 2.98	-1.04	0.300	37.57 ± 4.97	0.39	0.694	2.33 ± 2.38	-1.29	0.196
Female	198 (49.87)	7.55 ± 2.86			37.39 ± 4.02			2.64 ± 2.47		
Age(years)										
< 18	4 (1.01)	5.00 ± 5.77	5.06	0.002	41.75 ± 5.38	1.35	0.257	2.50 ± 5.00	1.50	0.215
18-35	237 (59.70)	7.03 ± 2.94			37.32 ± 4.60			2.27 ± 2.25		
36-59	135 (34.01)	7.92 ± 2.77			37.59 ± 4.29			2.81 ± 2.63		
≥ 60	21 (5.29)	8.67 ± 2.11			37.81 ± 4.86			2.71 ± 2.26		
Residence										
Urban	109 (27.46)	8.07 ± 2.53	3.10	0.002	4.602 ± 0.44	-0.94	0.349	2.52 ± 2.88	0.20	0.843
Rural	288 (72.54)	7.14 ± 3.02			4.496 ± 0.27			2.47 ± 2.48		
Educational level										
Middle school and below	135 (34.01)	6.84 ± 3.31	3.25	0.022	37.47 ± 4.86	0.46	0.707	2.72 ± 2.72		
Polytechnic and high school	110 (27.71)	7.45 ± 2.67			37.31 ± 4.35			1.95 ± 2.14	3.06	0.028
Junior college	63 (15.87)	7.62 ± 2.57			38.08 ± 4.34			2.35 ± 1.85		
Bachelor degree and above	89 (22.42)	8.03 ± 2.69			37.30 ± 4.38			2.88 ± 2.55		

Table 1 (*continued*). Comparison of psychological distress, level of hope, and family function scores of patients with COVID-19 with different demographic characteristics and epidemic-related information in the FSH.

Variable	Total n (%)	APGAR M ± SD	t / F	p	HHI M ± SD	t / F	p	DT M ± SD	t / F	p
Marital status										
Unmarried	132 (33.25)	6.74 ± 3.01	7.28	0.001	37.24 ± 4.42	0.48	0.619	2.18 ± 2.22	1.67	0.189
Married	256 (64.48)	7.79 ± 2.78			37.64 ± 4.63			2.65 ± 2.53		
Divorced or widowed	9 (2.27)	5.78 ± 3.46			36.67 ± 3.00			2.22 ± 1.79		
Occupation										
Enterprises and institutions	55 (13.85)	7.82 ± 2.50	1.83	0.106	36.38 ± 4.65	2.10	0.064	2.45 ± 2.32	0.57	0.726
Individual operation	46 (11.59)	7.22 ± 3.01			38.33 ± 4.78			2.11 ± 2.30		
Medical personnel	33 (8.31)	7.88 ± 2.83			36.24 ± 5.06			2.61 ± 2.42		
Worker	106 (26.70)	6.78 ± 3.15			38.03 ± 4.38			2.52 ± 2.31		
Farmer	38 (9.57)	7.16 ± 3.02			36.74 ± 3.24			2.97 ± 2.94		
Other	119 (29.97)	7.76 ± 2.79			37.76 ± 4.58			2.42 ± 2.47		
Medical insurance										
Medical insurance for urban employees	156 (39.29)	7.76 ± 2.59	3.89	0.002	37.03 ± 4.22	1.38	0.231	2.42 ± 2.27	1.02	0.403
Medical insurance for urban residents	74 (18.64)	7.95 ± 2.63			38.11 ± 4.45			2.50 ± 2.33		
New rural cooperative medical insurance	109 (27.46)	7.14 ± 2.94			37.92 ± 4.89			2.54 ± 2.52		
Socialized medicine	12 (3.02)	5.08 ± 4.36			36.08 ± 3.94			3.75 ± 3.55		
Self-paid	34 (8.56)	6.24 ± 3.62			37.88 ± 4.21			2.41 ± 2.56		
Other	12 (3.02)	7.33 ± 2.96			35.92 ± 6.16			1.58 ± 2.47		
Average personal income (Yuan)										
< 5000	160 (40.30)	7.21 ± 3.03	1.07	0.370	37.33 ± 4.15	0.14	0.969	2.51 ± 2.52	1.33	0.258
5000-10000	171 (43.07)	7.51 ± 2.88			37.57 ± 4.90			2.37 ± 2.32		
10000-15000	48 (12.09)	7.19 ± 2.95			37.50 ± 4.28			2.46 ± 2.43		
15000-20000	8 (2.02)	8.13 ± 2.03			38.13 ± 4.32			4.38 ± 2.83		
> 20000	10 (2.52)	8.90 ± 1.85			38.00 ± 3.86			2.60 ± 2.17		
Have chronic diseases										
Yes	48 (12.09)	7.69 ± 2.87	0.73	0.464	37.38 ± 4.45	-0.18	0.859	3.40 ± 2.69	2.80	0.005
No	349 (87.91)	7.36 ± 2.93			37.50 ± 4.54			2.36 ± 2.36		
Drugs（Except: COVID-19 treatment drugs) (kinds)										
0	263 (66.25)	7.35 ± 2.95	1.50	0.213	37.62 ± 4.35	2.73	0.044	2.26 ± 2.28	10.41	0.000
1	75 (18.89)	7.03 ± 2.91			37.03 ± 4.99			2.65 ± 2.74		
2-3	51 (12.85)	8.12 ± 2.51			38.08 ± 3.96			2.69 ± 1.99		
≥ 4	8 (2.02)	7.75 ± 4.20			33.50 ± 7.21			6.88 ± 2.59		
COVID-19-related characteristics										
COVID-19 vaccination										
Yes	364 (91.69)	7.38 ± 2.94	-0.37	0.715	37.59 ± 4.58	1.91	0.063	2.46 ± 2.41	-0.75	0.452
No	33 (8.31)	7.58 ± 2.76			36.27 ± 3.73			2.79 ± 2.58		
COVID-19 symptoms										
Yes	195 (49.12)	7.38 ± 2.95	-0.09	0.929	37.19 ± 4.03	-1.26	0.210	2.90 ± 2.36	3.38	0.001
No	202 (50.88)	7.41 ± 2.89			37.76 ± 4.95			2.08 ± 2.43		
COVID-19 infection (times)										
1	380 (95.72)	7.43 ± 2.87	0.76	0.461	37.52 ± 4.42	0.46	0.651	2.49 ± 2.44	0.43	0.667
≥ 2	17 (4.28)	6.71 ± 3.90			36.76 ± 6.67			2.24 ± 2.08		
COVID-19 isolation (times)										
1	343 (86.40)	7.48 ± 2.87	1.74	0.177	37.57 ± 4.47	6.03	0.003	2.52 ± 2.43	6.18	0.002
2-3	41 (10.33)	6.88 ± 3.12			37.27 ± 3.86			1.76 ± 1.76		
≥ 4	5 (1.26)	5.60 ± 3.72			30.60 ± 8.30			5.60 ± 3.91		
FSH-related characteristics										
Isolation with family members in FSH										
Yes	151 (38.04)	7.62 ± 2.93	1.20	0.230	37.38 ± 4.85	-0.37	0.715	2.70 ± 2.55	1.41	0.160
No	246 (61.96)	7.26 ± 2.91			37.55 ± 4.32			2.35 ± 2.34		
First stay in the FSH										
Yes	383 (96.47)	7.38 ± 2.91	-0.51	0.614	37.54 ± 4.44	1.25	0.212	2.50 ± 2.44	0.54	0.593
No	14 (3.53)	7.79 ± 3.36			36.00 ± 6.45			2.14 ± 2.14		
FSH living experience										
General	69 (17.38)	6.35 ± 2.84	9.39	0.000	36.71 ± 4.31	19.99	0.000	3.28 ± 2.57	6.66	0.001
Good	202 (50.88)	7.28 ± 2.88			36.50 ± 4.03			2.53 ± 2.32		
Excellent	126 (31.74)	8.17 ± 2.85			39.49 ± 4.76			1.98 ± 2.41		
FSH sports										
Rarely	77 (19.40)	7.18 ± 2.90	0.46	0.768	36.51 ± 4.83	6.05	0.000	3.13 ± 2.56	4.42	0.002
Less	89 (22.42)	7.44 ± 2.71			36.81 ± 3.74			2.67 ± 2.19		
General	182 (45.84)	7.35 ± 3.06			37.51 ± 4.35			2.19 ± 2.32		
More frequently	38 (9.57)	7.95 ± 2.63			39.89 ± 3.88			1.68 ± 2.13		
Very frequently	11 (2.77)	7.45 ± 3.59			41.00 ± 8.06			4.00 ± 4.10		
FSH diet										
Poor	17 (4.28)	6.76 ± 2.44	3.73	0.025	36.12 ± 4.90	8.68	0.000	4.76 ± 2.77	13.07	0.000
General	182 (45.84)	7.03 ± 3.03			36.60 ± 3.92			2.77 ± 2.43		
Good	198 (49.87)	7.79 ± 2.81			38.41 ± 4.83			2.03 ± 2.25		
FSH living material support										
Adequate guarantee	267 (67.25)	7.49 ± 2.97	0.87	0.385	38.04 ± 4.55	3.65	0.000	2.23 ± 2.34	-2.99	0.003
Partial guarantee	130 (32.75)	7.22 ± 2.82			36.34 ± 4.27			3.00 ± 2.52		

FSH: Fangcang shelter hospital; APGAR: family APGAR index; HHI: Herth hope index; DT: distress thermometer. M ± SD: mean ± standard deviation; COVID-19: coronavirus disease 2019. An independent sample *t*-test for comparison between two groups, and the *t* value is its test statistic. One-way ANOVA was used for comparison between multiple groups, and the *F* value is its test statistic. $p < 0.05$ indicates that the difference is statistically significant.

Table 2. Correlation analysis of psychological distress, level of hope, and family care.

Variable	T	P	I	HHI	A①	P	G	A②	R	APGAR	DT
T	1.00										
P	0.70**	1.00									
I	0.71**	0.79**	1.00								
HHI	0.88**	0.93**	0.92**	1.00							
A①	0.10	0.15**	0.03	0.11*	1.00						
P	0.13**	0.21**	0.09	0.16**	0.76**	1.00					
G	0.18**	0.26**	0.15**	0.22**	0.67**	0.73**	1.00				
A②	0.19**	0.23**	0.13*	0.20**	0.67**	0.74**	0.74**	1.00			
R	0.17**	0.25**	0.16**	0.22**	0.68**	0.72**	0.76**	0.79**	1.00		
APGAR	0.17**	0.25**	0.13*	0.20**	0.86**	0.90**	0.88**	0.89**	0.89**	1.00	
DT	-0.13*	-0.19**	-0.07	-0.15**	-0.08	-0.12*	-0.09	0.13*	0.11*	-0.12*	1.00

T: temporality and future; P: positive readiness and expectancy; I: interconnectedness; HHI: Herth hope index. A①: adaptation; P: partnership; G: growth; A②: affection; R: resolve. APGAR: Family APGAR index. DT: distress thermometer. *$p < 0.05$, **$p < 0.01$.

One-way ANOVA was used for comparison between multiple groups, and the factors influencing psychological distress were determined using binary logistic regression. $p < 0.05$ indicated that the difference was statistically significant.

Results

Majority of the patients in FSH were from the countryside, married, aged 18-59 years, and completed a senior high school level or below (Table 1). The patients reported symptoms of severe psychological distress (n = 109, 27.46%) and low levels of family care (n = 152, 38.29%). More than half of the patients (n = 244, 61.46%) exhibited high levels of hope, and around one-third of the patients (n = 151, 38.04%) reported moderate levels of hope. Age, registered residence location, level of education, marital status, medical insurance type, FSH living experience, and diet influenced the level of family function ($p < 0.05$). Types of drugs (except for those against COVID-19), isolation times, FSH living experience, sports, diet, and life security affected the level of hope ($p < 0.05$). Level of education, combined chronic diseases, drug types, isolation times, FSH living experience, sports, diet, life security, and the absence/presence of COVID-19

symptoms influenced the level of psychological distress ($p < 0.05$).

The score for psychological distress was significantly negatively correlated with the APGAR score and positively correlated with level of hope (Table 2). Moreover, the APGAR score was significantly positively correlated with the level of hope.

The variables with statistical significance in the difference test were taken as the independent variables and whether the patient had severe psychological distress was taken as the dependent variable for binary logistic regression analysis. The multicategory discontinuous variables, such as the FSH living experience, were converted into dummy variables. Table 3 presents the assignment of independent variables. The FSH living experience, diet, and COVID-19 symptoms were closely related to psychological distress of patients with COVID-19 ($p < 0.05$) (Table 4). The risks of psychological distress were: 0.47 times more likely with a good living experience ($p = 0.019$); 0.32 times more likely with an excellent living experience ($p = 0.006$); 0.36 times more likely with good than poor diet ($p = 0.020$); and 1.82 times more likely in patients with COVID-19

Table 3. Independent variables for the regression analysis of factors influencing psychological distress.

Independent variables	Assignment of independent variables
Educational level	High school and below = 0, college degree or above = 1
Other chronic diseases	No = 0, yes = 1
Drugs (except COVID-19 treatment drugs)	0 kinds = 0, 1 kind or above = 1
Isolation times	Once = 0, 2 times or above = 1
FSH living experience	General = 0, good = 1, excellent = 2
FSH sports	Rarely and less = 0, general = 1, more frequently and very frequently = 2
FSH diet	Poor = 0, general = 1, good = 2
FSH living material support	Partial guarantee = 0, adequate guarantee = 1
COVID-19 symptoms	No = 0, yes = 1
APGAR	Low degree of family care = 0, high degree of family care = 1
HHI	Low and medium level = 0, high level = 1

FSH: Fangcang shelter hospital. COVID-19: coronavirus disease 2019. APGAR: family APGAR index. HHI: Herth hope index.

symptoms than without COVID-19 symptoms (*p* = 0.016; Table 4).

Discussion

COVID-19 is a severe pandemic which posed a major threat to global health [31]. Three years after the outbreak, the pandemic has gradually subsided in some countries, whereas others have adopted a strategy of coexisting with the virus [32,33]. In China, FSH may become a major part of the country's response to COVID-19 and future pandemic and public health emergencies [9,34]. The FSH model in Shanghai demonstrated its significance as a critical measure for patient care and pandemic control [19]. Other countries may learn from the pandemic control measures adopted by China, which included the FSH as an alternative to crowded traditional hospitals during the peak of the pandemic [35]. Previous research has demonstrated that patients with confirmed or suspected COVID-19 experienced fear of the consequences of infection as well as boredom, loneliness, and anger [36]. The results revealed that there was a high level of psychological distress among patients in the FSH in Shanghai during the COVID-19 pandemic.

The reasons for this psychological distress may include the severe pandemic situation. During the investigation period, Shanghai was still under lockdown, and the number of newly confirmed cases and asymptomatic infection cases per day were the highest in the country [22]. Shanghai is China's financial center, and it faced especially severe challenges in controlling the outbreak with minimal social and economic costs [23]. During isolation, the work, life, and study of the patients were greatly affected and the patients wanted to return to normal life and work [24]. In addition, the fear of disease led to psychological distress [37]. COVID-19 is characterized by rapid transmission, mutation, wide transmission routes, and the general susceptibility of the population [38]. The patients lacked confidence in their natural resistance and experienced increased levels of anxiety and fear as a result of pandemic-related information mixed with negative and false information [12]. The changes in the living environment of the patients, which ranged from familiar, comfortable, and private homes to unfamiliar, limited, and shared living conditions in the FSH also led to psychological distress [22,39]. This was due to the reduction of social and family support [37], which decreased due to isolation and separation from family and friends.

Moreover, multiple logistic regression analysis illustrated that the living experience and diet in the FSH and COVID-19 symptoms were closely related to the psychological distress of patients with COVID-19. For example, many patients reported that the extremely bright light at night in the hospital was the main reason of their sleeping problems [13]. This defect in quality of life impacted their mental health. The other probable reasons included the common symptoms of COVID-19 (e.g., fever, shortness of breath, and headache), which can lead to psychological symptoms. In addition, patients with more symptoms were generally more severely affected than asymptomatic patients, and they were less concerned about the progression of the illness [40,41].

Hope is a positive force in the face of adversity, which makes an individual confident and driven to achieve goals [42]. Physiologically, hope can weaken the physical symptoms and uncomfortable feelings of patients. Psychologically, hope can encourage patients to firmly believe that difficulties can be overcome and to actively address the difficulties due to disease and isolation [43]. The study found that the level of hope of patients in the FSH was relatively high. The reason is that the government of China provided appropriate information and knowledge in a timely manner. Transparency and open communication can efficiently lower fear, anxiety, stigmatization, and discrimination [44]. Moreover, the National Health Commission of China performed psychological crisis interventions through the general deployment of disease prevention and mental health professionals and expert groups,

Table 4. Logistic regression analysis on the influencing factors of psychological distress among patients with COVID-19 in the FSH (n = 397).

Independent variables	β value	Std error	Wald	OR	95%CI	*p*
FSH living experience (general)						
Good	-0.77	0.33	5.48	0.47	0.25-0.88	0.019
Excellent	-1.13	0.41	7.66	0.32	0.15-0.72	0.006
FSH diet (poor)						
General	-1.02	0.59	2.95	0.36	0.11-1.16	0.086
Good	-1.42	0.61	5.37	0.24	0.07-0.80	0.020
COVID-19-related symptoms	0.60	0.25	5.78	1.82	1.12-2.98	0.016
Constant	0.80	0.65	1.48	2.22		0.223

Std Error: Standard Error; FSH: Fangcang shelter hospital; COVID-19: coronavirus disease 2019.

which provided psychological intervention for different subpopulations, including patients isolated in FSH [45,46]. Early intervention for psychological crises improved the level of hope of patients with COVID-19. The type of medicine, isolation times, living experience, exercise, appetite, life support, family care, and psychological distress in FSH were closely related to the level of hope of patients.

Family functioning refers to the effectiveness with which family members provide emotional connection, family rules, and communication and help cope with external events. Family function plays a direct role in the mental and physical health and disease prognosis of family members [47]. During the pandemic, the family was an important factor that influenced the level of individual mental health, such that patients with high levels of family bond and a harmonious family atmosphere exhibited high values in the individual mental health index [48]. In the FSH, patients were not accompanied by family and maintained contact through online channels such as the internet, WeChat, and mobile phones. Time was limited, and face-to-face communication was restricted. For these reasons, patients were relatively lonely, unable to express their emotions, and their psychological pressure is relatively high.

In addition, the study found that the psychological distress score was significantly negatively correlated with the APGAR score and positively correlated with level of hope. Moreover, the APGAR score was significantly positively correlated with level of hope. Thus, the study suggested that levels of family function and hope exerted a negative predictive effect on the psychological distress response of individuals to the pandemic. This finding indicated that the better the family function for individuals in the form of high levels of satisfaction and closeness with the family, the better their psychological adaptability during the pandemic and the higher the level of hope, which may lead to improved spiritual health [49] and reduction of psychological distress.

Based on the mental status and psychological needs of patients within the special environment of makeshift hospitals, health care workers should provide additional effective interventions to relieve the psychological pain of patients and improve their levels of hope and family function. For example, a book corner may be set up to provide rehabilitation manuals, life encyclopedias, children's picture books and other reading materials to provide learning space for patients. Patients may be guided to carry out activities such as singing, yoga, square dance, and shadowboxing, to enrich life at FSH.

The coverage of WIFI network signal in the FSH may be strengthened so that patients can have uninterrupted video calls with their families at any time to improve family support. Air conditioning may be installed to ensure indoor warmth and comfort. Warm yellow light strips may be set up around the bed, and more green plants may be placed to create a warm environment. Adequate snacks such as biscuits, fruits, milk, chocolate, etc. may be provided to meet the needs of children and young people. Science education focusing on diseases and mental health may be made accessible through online teaching, audio and video production, and animation and manga media. Medical staff and psychological experts may collaborate to provide psychological intervention through online video consultation, online group counseling, and offline group intervention.

This study has several limitations. First, this study used a mobile WeChat applet for the online questionnaire survey, and the target population was patients with COVID-19 in FSH. Thus, random sampling was not conducted. Moreover, the sample size was limited, which may limit its representativeness. Consequently, the results should be interpreted with caution. Second, the online self-assessment method could inevitably lead to errors in the understanding of the respondents about the evaluation items, which may affect the results. Third, this study was unable to distinguish the association between symptoms and patients in the FSH versus those in other designated hospitals because another group for comparison was lacking. Moreover, the study was unable to differentiate between pre-existing mental health symptoms versus new ones. Finally, the survey was conducted within a span of one month and lacked longitudinal follow-up. Hence, the psychological changes of the patients were not continuously observed, and psychological intervention was not evaluated. Thus, the study suggests that future research is required to expand the sample and continue the promotion of relevant psychological intervention and the evaluation of effects.

Conclusions

The study conducted a survey of the mental health status of patients with COVID-19 treated in the FSH. The patients reported high rates of psychological distress, low levels of family care, and relatively high levels of hope. Considering the special environment of shelter hospitals and the psychological needs of patients, health care workers should provide more effective interventions for improving the living and

eating conditions in the FSH, strengthening remote support and contact with families, and alleviating the COVID-19 related symptoms of patients to alleviate the psychological distress level of patients and enhance their confidence in overcoming the COVID-19 pandemic.

Data availability statement
The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

Ethics statement
This study was approved by the Biomedical Research Ethics Committee, West China Hospital of Sichuan University (approval number: 2020513). All procedures complied with the ethical standards of the latest version of the Helsinki Declaration. All patients provided informed consent.

Authors' contributions
Qingqing Xiao and Xia Huang were responsible for the drafting and revising of the manuscript and had full access to all data in the study. Jingjun Wang, Yalin Huang, Yan Feng, Dan Wang, and Ya Kou contributed to the implementation of the study. Lei Huang and Ya Wang were responsible for guiding the revision of the manuscript. All authors contributed to the design of the study and the refinement of the manuscript.

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