Research Article

Investigation the Impact of Social Support, Resilience on Posttraumatic Growth of COVID-19 Patients in Shanghai Cabin Hospital

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Abstract

COVID-19 has affected hundreds of millions of people around the world.

INTRODUCTION

Since the disease spreads primarily through close contact with someone infected with SARS-COV-2, the main common strategy to reduce the risk of COVID-19 infection is taking physical distancing measures, such as cancellation of large gatherings, shutting down businesses, travel restrictions and quarantining [1]. Omicron, a new variant of SARscov-2 with novel epidemiological and biological characteristics, is more infectious than other variants. The main clinical manifestations are "mild infections", including headache, muscle ache, cough, fever, and severe fatigue [2].

COVID-19 surge with omicron BA.2 variant has swept Shanghai from March to May in 2022 [3]. People have been quarantined at home, industry and commerce have been stopped, which have caused huge economic losses to society. Fortunately, under the guidance of the government, urban public health prevention and control became the key to effective management of the epidemic. In order to control the spread of COVID-19, the Shanghai COVID-19 Prevention and Control Command Center has built a large number of cabin hospitals to treat asymptomatic and mild patients. COVID-19 patients may experience much more psychological stress due to isolation treatment or other reasons than the general public, as well as potentially traumatic situations during hospitalization [4]. Mental health problems in hospitalized COVID-19 patients must therefore be identified and treated promptly.

Posttraumatic growth

As has been observed during previous epidemics, patients experience severe psychological problems during the acute phase of the disease and in the long term after the epidemic. Fear, depression and anxiety are common mental health problems and even post-traumatic stress disorder (PTSD) in patients with infectious diseases [5]. In contrast, post-traumatic growth (PTG) is expressed in self-awareness, interpersonal relationships and appreciation of life that develop from a potentially traumatic event [6,7]. PTG refers to the positive psychological changes as a result of struggling with an extremely challenging life environment. The relationship between PTG and adverse mental health outcomes is mixed, with some studies observing no or positive correlation between PTG and these outcomes [8,9]. In addition, previous studies have extensively investigated the negative consequences and mental distress of contracting COVID-19, but little has been done on the potential positive consequences, particularly PTG in cabin hospital patients.

Social support

Social support as a supportive social context and key environmental resource [10,11] can help successful people face difficulties and cognitive adaptation processes in the face of disease diagnosis, thereby promoting PTG. Individuals with higher levels of support are more likely to tell their stories and survival and adopt a perspective that can be integrated

into schema changes [12]. One recent report indicates that the perceived social support for Chinese ambulance personnel has a significant direct effect on PTG, and the negative effects of trauma they encounter can be reduced by providing more support resources [13]. As yet, few researches have attempted to understand the relationship between perceived social support and PTG among COVID-19 cabin hospital survivors. Therefore, further research on the relationship between social support and PTG is needed.

Resilience

Resilience is the process of being able to adjust well in the face of adverse situations, trauma, and even significant sources of threat [14]. Resilient individuals are more likely to focus on positive emotions, and demonstrate cognitive mental toughness under stressful circumstances, which helps them maintain psychological adaption to other challenging situations [15]. For some time, another comprehensive concept of resilience has been introduced, referring to the protective traits of an individual's adaptation to disease [16]. A recent study has shown that post-traumatic growth is positively correlated with resilience, and that resilience mediates between positive coping styles and post-traumatic growth. Some [17]. Researchers believe that if trauma experienced by highly resilient individuals is not sufficient to build the process of meaning-making, people will not have sufficient opportunity to develop PTG [10,18]. Given these conflicting views, further investigations to clarify this relationship are essential and the role of resilience in PTG among COVID-19 patients need to be examined.

In this study, we aimed to explore the levels of PTG in COVID-19 patients in Shanghai cabin hospital, and test the direct and indirect effects of variables on PTG. In addition,we further investigated the correlations of perceived social support, resilience, and PTG between COVID-19 survivors and hospitalized patients. It's an important target of treatment to develop interventions that contributes to improving PTG.

MATERIAL AND METHODS

Participants and procedures

A total of 204 participants were recruited using a convenience sampling method from Shilonglu Cabin Hospital in Shanghai, China. Inclusion criteria: aged 21–71 years; confirmed of COVID-19 infection and clinically classified as asymptomatic or mild symptom cases in accordance with the national diagnostic and therapeutic guideline; consenting for participation in the study. Exclusion criteria: cognitive impairment or mental or psychological illness; severe visual, hearing or speech disorders. The present study was approved by the Shandong Provincial Hospital Affiliated to Shandong First Medical University.

Of the 204 eligible patients,22 patients refused to participate in the study due to lack of time or interest in this research, and the other 182 qualified patients provided consent and completed the survey. The response rate was 89.2%. The survey was conducted in the form of an electronic questionnaire, and logic

verification was set to improve the validity of the questionnaire. The researchers instructed the patients to complete the questionnaire with unified language. The patients anonymously filled out the questionnaires. The participants were informed of the study aim and informed consents were obtained when the participants were recruited.

Measures

Demographic variables: Participants' demographic information was collected, such as age, gender, resident status, education level, marriage status, monthly personal income and employment status. Participants were asked to report whether they received the diagnosis of any chronic diseases (i.e. hypertension, diabetes, cancers and other chronic diseases) before COVID-19 infection.

Measurement of posttraumatic growth: The Posttraumatic Growth Inventory (PTGI) is developed by Tedeschi and Calhoun. The modified version contains 20 items, with one item deleted from the original scale, which have been widely used among Chinese samples [19,20]. The Chinese version of PTGI consists of five dimensions: interpersonal relationship, new possibilities, personal strength, spiritual change, and appreciation of life. The Cronbach's α coefficient for the globe scale and subscale is 0.937 and 0.742-0.868, respectively. 6-point Likert scale is used for this scale from1 (totally disagree) to 5 (totally agree). A higher score indicates a higher level of PTG.

Measurement of perceived social support Scale

The perceived social support scale (PSSS) is a 12-item scale developed by Zimet et al., [21]. A valid Chinese version of PSSS was used to assess individuals' perceived social support [22]. The Chinese PSSS version has 12 items; each item is rated on a 7-point Likert scale ranging from 1 (totally disagree) to 7 (totally agree). The total score is the sum of the scores for all events. A higher score indicates a higher level of perceived social support. The Cronbach's α coefficients 0.898 in this study.

Measurement of resilience: The original 25-item Connor-Davidson Resilience Scale (CD-RISC) is developed by Connor and Davidson [23]. Each item is rated on a 5-point Likert scale ranging from 0 (not true at all) to 4 (almost always true). The Chinese version has showed good psychometric properties, which is widely used in Chinese samples [24]. The total score ranges from 0~100, and a higher score indicates a higher level of resilience. The Cronbach's α coefficient is 0.946 in present study

Data analysis

Demographic information, like gender and age, was provided by number (n) and percent (%). The continuous variables are presented as mean± SD. Independent-sample t tests or analysis of variance were used to compare continuous data among groups, while Bonferroni correction was used in comparing each two means for three. The Spearman correlation analyses were carried out to explore the associations among the key variables,and multiple stepwise regression analysis was employed to analyze the factors affecting the PTG in patients with COVID-19. Data

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analyses were performed with IBM SPSS statistical version 22.0 (IBM Corp). The statistical significance was set at $P < 0.05$, and all tests were two-tailed.

RESULTS

Demographic characteristics

Of 182 cases with COVID-19, aged from 21 to 71 years old, with an average of 60.87±10.30 years old, 139(76.4%) were male; 161(88.5%) married; 108(59.3%) lived in the city; 94(51.6%) were or below junior high school level; 92(50.5%) were on the job; 107(58.8%)with a personal income less than 3000 every month;172(94.5%) had city or country health insurance; 119(65.4%) had a previous history, such as hypertension and diabetes mellitus [Table 1].

The scores of PTG

The total PTG scores of all dimensions were significantly higher than norms ($P <0.01$). The average PTG score of patients in cabin hospital was 69.01±15.96, with appreciation of life 21.91±5.04, personal strength 10.36±3.00, new possibilities 13.16±3.67, interpersonal relationship 10.75±2.83, and spiritual change 12.82±3.94, respectively. There were significant differences of all PTG dimensions in patients compared with norms. Datas were shown in [Table 2]. In the correlation analysis between PTG scores and demographic information, independent-

Table 1 Demographic characteristics

Variables	N(%)/ range	M±SD	Variables	n(%)
Gender			Marriage	
Male	139(76.4)		Married	161(88.5)
Female	43(23.6)		Unmarried/ Divorced	21(11.5)
Age	31~86	60.87±10.30	Residence	
Education			Rural	74(40.7)
Junior high or below	94(51.6)		Urban	108(59.3)
Senior high	49(26.9)		Monthly income(¥)	
College or above	39(21.4)		≤3000	107(58.8)
Employment			>3000	75(41.2)
Full-time	92(50.5)		Types of medical insurance	
Unemployed/ Retired	90(49.5)		Self-paying	10 (5.5)
			Urban medical insurance	107(58.8)
			Rural medical insurance	65(35.7)

M±SD, mean ± standard deviation.

Table 2 Comparison of PTG scores between patients with COVID-19 and norms

Dimensions	Range	Patients	Norm	t	p
Total scores of PTG	0~100	69.01±15.96	59.15±13.759	8.459	0.000
Appreciation of life	0~30	21.91±5.04	20.89±3.74	2.734	0.007
New possibilities	0~20	13.16±3.67	10.50±3.96	9.787	0.000
Personal strength	0~15	10.36±3.00	9.35±2.56	4.528	0.000
Interpersonal relationship	0~15	10.75±2.83	9.39±2.53	6.491	0.000
Spiritual change	0~20	12.82±3.94	9.74±3.28	10.552	0.000

PTG, posttraumatic growth

sample *t* tests or analysis of variance showed that there were significant differences in total PTG scores among education (F = 3.165; $P<0.05$), residence (*t* = -1.863; $P<0.05$), and employment (*t* = -2.149; $P<0.05$); age was negatively related to PTG score (*r* = -0.175, $P < 0.05$). No significant differences in total PTG scores were found among the other sociodemographic variables [Table 3].

Correlationship of social support, resilience, and PTG

The average PSSS score of patients with COVID-19 in cabin hospital was 74.18 ± 9.41, with family support 26.29 ± 2.62, friend support 23.40 ± 4.64, and other support 24.48 ± 3.90; resilience total score was 67.01 ± 17.01, including mental toughness score 35.57 ± 9.39, strength score 22.80 ± 5.93, and optimism score 8.75 ± 3.15, respectively [Table 4].

The level of perceived social support (*r* = 0.281~0.445, $P < 0.001$) and greater resilience (*r* = 0.394~0.745, $P < 0.001$) were significantly associated with higher PTG scores. Moreover, a higher level of perceived social support was significantly associated with greater resilience (*r* =0.442, $P < 0.001$).

Influencing factors of PTG in patients with COVID-19

Multiple linear regression analysis of PTG showed that, age (*β*=-0.144~P=0.015), mental toughness (*β*=0.206~P=0.04) and strength (*β*=0.410~P<0.001) could significantly predict the appreciation of life dimension [Table 5]; age (*β*=-0.198~P=0.001), friend support (*β*=0.246, P=0.002) and mental toughness (*β*=0.469, P<0.001) could significantly predict the new possibilities dimension [Table 6]; age (*β*=-0.129,P=0.032) and mental toughness (*β*=0.446, P<0.001) could significantly predict personal strength dimension [Table 7]; family support(*β*=0.239, P=0.001) and mental toughness (*β*=0.285, P=0.012) could significantly predict interpersonal relationship dimension [Table 8]; mental toughness (*β*=0.276, P=0.014) can significantly predict spiritual change dimension (Table 9). Age (*β*=-0.180, P=0.002), family support (*β*=0.121, P=0.048), mental toughness (*β*=0.343, P<0.001) and strength (*β*=0.256, P=0.01) could significantly predict the total score of PTG [Table 10].

DISCUSSION

The COVID-19 pandemic provides a unique context and opportunity to examine the presentation, development, and evolvement of PTG and resilience over time. This study was designed to explore the occurrence of PTG and factors associated with PTG among COVID-19 survivors in Shanghai cabin hospital. Our results indicated that these cabin hospitalized patients experienced disease-related positive changes. The PTG score of the cabin hospital patients was 69.01(SD=15.96), which was higher than norm score 59.15(SD=13.76). Dong reported that the mean total score on the PTG was 66.74 (SD =13.99) in colorectal cancer survivors, which was similar to our results[13]. In addition, the score was slightly lower than that reported in studies of hematopoietic stem cell transplantation caregivers [25]. The

Table 3 Analysis of patient posttraumatic growth scores based on Demographic characteristics

Variables	Appreciation of life		New possibilities		Personal strength		Relating to others		Spiritual change		Total scores of PTG	
	M±SD	F/t	M±SD	F/t	M±SD	F/t	M±SD	F/t	M±SD	F/t	M±SD	F/t
Gender		0.942		0.673		1.448		0.385		0.993		1.064
Male	22.11±5.12		13.26±3.70		10.55±2.84		10.80±2.82		13.00±3.96		67.50±15.92	
Female	21.28±4.76		12.84±3.55		9.72±3.42		10.60±2.93		12.30±3.90		66.74±16.06	
Age(r)	-0.173*		-0.235**		-0.159*		-0.043		-0.116		-0.175*	
Education		4.536*		1.450		1.748		2.368		1.784		3.165*
Junior high or below	20.94±4.80		12.59±3.44		9.77±3.47		10.26±2.95		12.26±4.10		65.37±16.18	
Senior high	22.18± 5.45		13.63±3.44		10.98±2.90		10.80±3.16		13.61±3.99		70.08±17.58	
college or above	23.55±4.81		13.64±3.98		10.44±2.71		11.45±2.40		13.02±3.85		73.22±15.00	
Employment		0.208		0.660		0.688		-0.956		0.157		0.162
Full-time	21.99±5.00		13.34±3.73		10.45±3.09		10.96±2.66		12.87±3.90		69.20±16.07	
Unemployed/ Retired	21.83±5.11		12.98±3.61		10.2±72.92		10.96±2.66		12.78±4.00		68.81±15.93	
Marriage		-0.242		1.169		1.056		-1.205		-0.110		0.182
Married	21.88±5.11		13.25±3.75		10.45±2.97		10.68±2.90		12.81±4.00		69.07±16.25	
Unmarried/ Divorced	22.14±4.59		12.43±2.94		9.67±3.18		11.33±2.27		12.90±3.49		68.48±13.85	
Residence		-1.606		-1.659		-0.674		-2.302*		-1.713		-1.863*
Rural	21.19±5.04		12.62±3.56		10.18±3.02		10.18±2.84		12.20±4.32		66.36±15.78	
Urban	22.41±5.00		13.53±3.71		10.48±3.00		11.15±2.77		13.25±3.62		70.81±15.90	
Monthly income (¥)		-2.397*		-0.905		-1.357		-1.958		-2.346*		-2.149*
≤3000	21.18±5.22		12.95±3.71		10.11±3.18		10.41±2.83		12.28±4.26		66.94±16.59	
>3000	22.95±4.62		13.45±3.60		10.70±2.70		11.24±2.78		13.60±3.32		71.95±14.61	
Medical insurance		2.282		1.861		0.101		1.881		0.872		1.601
Self-paying	23.00±6.72		15.50±3.32		10.75±3.77		10.25±2.50		11.00±7.52		70.50±21.73	
Urban insurance	22.39±4.97		13.43±3.68		10.38±2.85		11.07±2.74		13.14±3.79		70.42±15.73	
Rural insurance	20.89±5.16		13.52±3.64		10.26±3.32		10.22±3.02		12.32±4.00		66.22±16.25	

M±SD, mean ± standard deviation; PTG, posttraumatic growth; *P<0.05, **P<0.01.

Table 4 Association of social support, resilience and posttraumatic growth

Variables	M±SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1Total scores of PTG	69.00±15.96	1													
2 Appreciation of life	21.91±5.04	0.923***	1												
3 New possibilities	13.16±3.67	0.871***	0.729***	1											
4 Personal strength	10.36±3.00	0.855***	0.785***	0.704***	1										
5 Interpersonal relationship	10.75±2.83	0.745***	0.595***	0.632***	0.492***	1									
6 Spiritual change	12.82±3.94	0.870***	0.753***	0.673***	0.686***	0.572***	1								
7 Total scores ofsocial support	74.18±9.41	0.445***	0.374***	0.416***	0.340***	0.402***	0.388***	1							
8 Family support	26.29±2.62	0.344***	0.258***	0.293***	0.271***	0.403***	0.292***	0.711***	1						
9 Friend support	23.40±4.64	0.392***	0.329***	0.411***	0.300***	0.308***	0.336***	0.884***	0.432***	1					
10 Other support	24.48±3.90	0.376***	0.338***	0.318***	0.281***	0.334***	0.339***	0.884***	0.531***	0.645***	1				
11 Total scores of resilience	67.01±17.01	0.713***	0.668***	0.571***	0.629***	0.745***	0.610***	0.442***	0.353***	0.363***	0.398***	1			
12 Mental toughness	35.57±9.39	0.688***	0.639***	0.585***	0.642***	0.515***	0.579***	0.396***	0.319***	0.324***	0.355***	0.953***	1		
13 Strength	22.80±5.93	0.657***	0.671***	0.501***	0.567***	0.484***	0.556***	0.389***	0.315***	0.312***	0.356***	0.932***	0.831***	1	
14 Optimism	8.74±3.15	0.517***	0.505***	0.394***	0.439***	0.395***	0.461***	0.377***	0.227***	0.350***	0.342***	0.760***	0.619***	0.650***	1

M±SD, mean ± standard deviation; PTG, posttraumatic growth; ***P<0.001.

psychological pressure on COVID-19 patients due to isolation treatment and other reasons may be far greater than that of the general public, and the situations they face during hospitalization also produce potential trauma [26]. These survivors would be more psychosocial adjustment and better adaption than other disease survivors, which thereby experience greater PTG [27]. Patients who developed significantly higher scores for PTG demonstrated that there was a new recognition of the importance of family, enterprise and personal health [28]. After recovering from this crisis, survivors may have another perception and insight which makes them have a unique understanding and convey of life-consciousness.

Through comparison and analysis of baseline characteristics, we found no significant differences in employment, marriage, and types of medical insurance; however, there were significant differences in residence, education, and monthly income in PTG. In accordance with prior studies, age was negatively correlated with PTG [29]. A higher level of education was related to higher PTG, especially in appreciation of life subscale. High school or beyond educational attainment not only helped the patients to perform better but also improve his or her efficiency and capability of illness management [30]. Patients with lower levels of education were more likely to experience anxiety symptoms, which may be partly due to a lack of definitive knowledge about

Table 5 Multiple stepwise regression analysis for the influencing factors on appreciation of life in PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Age	-0.180	0.020	-0.154	0.039	-0.144	0.015
Education	0.008	0.926	0.041	0.615	-0.039	0.552
Monthly income	0.178	0.036	0.131	0.101	0.042	0.507
Family support	-	-	0.123	0.143	0.019	0.771
Friend support	-	-	0.149	0.105	0.070	0.338
Other support	-	-	0.154	0.117	0.021	0.788
Mental toughness	-	-	-	-	0.206	0.040
Strength	-	-	-	-	0.410	0.000
Optimism	-	-	-	-	0.071	0.343
p		0.009		0.000		0.000
F		3.990**		6.731***		19.432***
R^2		0.063		0.188		0.504
ΔR^2		0.047		0.160		0.478

PTG, posttraumatic growth, **$P<0.01$, ***$P<0.001$.

Table 6 Multiple stepwise regression analysis for the influencing factors on new possibilities in PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Age	-0.235	0.001	-0.228	0.001	-0.198	0.001
Family support	-	-	0.193	0.017	0.104	0.144
Friend support	-	-	0.310	0.001	0.246	0.002
Other support	-	-	-0.010	0.912	-0.095	0.250
Mental toughness	-	-	-	-	0.469	0.000
Strength	-	-	-	-	0.023	0.831
Optimism	-	-	-	-	0.006	0.943
P		0.001		0.000		0.000
F		10.547**		13.565***		19.254***
R^2		0.055		0.235		0.436
ΔR^2		0.050		0.217		0.414

PTG, posttraumatic growth, **$P<0.01$, ***$P<0.001$.

Table 7 Multiple stepwise regression analysis for the influencing factors on personal strength in PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Age	-0.159	0.032	-0.161	0.026	-0.129	0.032
Family support	-	-	0.190	0.026	0.086	0.230
Friend support	-	-	0.164	0.080	0.083	0.292
Other support	-	-	0.057	0.570	-0.051	0.544
Mental toughness	-	-	-	-	0.446	0.000
Strength	-	-	-	-	0.127	0.248
Optimism	-	-	-	-	0.046	0.562
p		0.032		0.000		0.000
F		4.688*		7.340***		18.338***
R^2		0.025		0.142		0.425
ΔR^2		0.020		0.123		0.401

PTG, posttraumatic growth, *$P<0.01$, ***$P<0.001$.

Table 8 Multiple stepwise regression analysis for the influencing factors on interpersonal relationship in PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Residence	0.169	0.022	0.157	0.020	0.107	0.090
Family support			0.307	0.000	0.239	0.001
Friend support			0.096	0.285	0.039	0.635
Other support			0.103	0.279	0.021	0.809
Mental toughness			-	-	0.285	0.012
Strength			-	-	0.109	0.348
Optimism			-	-	0.048	0.577
p		0.022*		0.000		0.000
F		5.300		12.062***		13.517***
R^2		0.029		0.214		0.352
ΔR^2		0.023		0.196		0.326

PTG, posttraumatic growth, *$P<0.01$, ***$P<0.001$.

Table 9 Multiple stepwise regression analysis for the influencing factors on spiritual change in PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Monthly income	0.162	0.027	0.131	0.057	0.031	0.617
Severity of disease	-0.147	0.045	-0.150	0.029	-0.109	0.077
Family support			0.127	0.119	0.053	0.457
Friend support			0.146	0.110	0.079	0.329
Other support			0.177	0.069	0.065	0.449
Mental toughness			-	-	0.276	0.014
Strength			-	-	0.188	0.100
Optimism			-	-	0.099	0.226
p		0.011		0.000		0.000
F		4.607*		8.294***		14.142***
R^2		0.049		0.191		0.395
ΔR^2		0.038		0.168		0.367

PTG, posttraumatic growth, *$P<0.01$, ***$P<0.001$.

Table 10 Multiple stepwise regression analysis for the influencing factors on total scores of PTG

Variables	Step1		Step2		Step3	
	β	P	β	P	β	P
Age	-0.220	0.006	-0.202	0.007	-0.180	0.002
Education	-0.060	0.511	-0.017	0.841	-0.078	0.237
Residence	0.144	0.088	0.126	0.103	0.105	0.084
Monthly income	0.134	0.117	0.082	0.289	0.000	0.997
Severity of disease	-0.139	0.055	-0.137	0.038	-0.087	0.098
Family support	-	-	0.225	0.005	0.121	0.048
Friend support	-	-	0.169	0.057	0.101	0.147
Other support	-	-	0.124	0.187	-0.008	0.916
Mental toughness	-	-	-	-	0.343	0.000
Strength	-	-	-	-	0.256	0.010
Optimism	-	-	-	-	0.063	0.373
p		0.005		0.000		0.000
F		3.520**		8.099***		19.990***
R^2		0.091		0.272		0.564
ΔR^2		0.065		0.239		0.536

PTG, posttraumatic growth, **$P<0.01$, ***$P<0.001$.

COVID-19. In our study, urban residents showed higher level in interpersonal relationship and total PTG score than those living in rural areas. Some basic services in the urban districts like rubbish-collection, newspaper and milk-delivery, make life more convenient than rural areas. For urban residents, they can keep communication with others smoothly, heart to heart, loneliness will evaporate instantly. We figured out that survivors making more than ¥3000 a month indicated higher scores in spiritual change and appreciation of life in PTG than those with a lower monthly income. It is not difficult to understand higher-income families are likely to have lower financial burden and a massive amount of confidence, which reduce emotional and psychological distress, allowing them to recover from trauma [31].

According to Tedeschi and Calhoun's theory, social support as a positive external resource could facilitate PTG. Social support is defined as the assert of effective social networks and supportive relationships with the therapeutic effects on mental health [32]. It can serve as a buffer against the severity of the traumatic events and foster people's recovery from the difficulties [33]. The present study revealed that the scores in all dimensions of social support and PTG were positively correlated in COVID-19 survivors (r = 0.281~0.445, P < 0.001). After analyzed by multi-regression analysis method, family support was still the independent influencing factor and played a significant role to predict PTG. A previous research has come to similar conclusions, that is social support from friends and significant others was significant predictor of total PTG [34]. In hematopoietic stem cell transplantation caregivers, the correlation analyses revealed that posttraumatic growth was positively associated with resilience and social support [25]. In a post myocardial infarction population, not only were depressed individuals with high baseline support not at a increased risk of cardiac mortality, but also their depression symptoms were more likely to improve than those with low to moderate support [35]. Perceived social support works as a protective factor in reducing depression and anxiety during the COVID-19 pandemic [36]. Social support helps survivors to reconstruct their life experience, decrease stress and optimize their life.

Resilience usually refers to the ability to adapt to, or bounce back from, extreme unfavorable circumstances. It may also be defined as a system's capacity to "adapt successfully to significant challenges that threaten its function, viability, or development" [37]. Participants' resilience was assessed by using the Connor-Davidson Resilience Scale, with higher scores indicating higher levels of resilience. In the present study, the total score of resilience was 67.01 (SD=17.01), statistically higher than that in hematopoietic stem cell transplantation caregivers and U.S. young adults [25,38]. Our findings confirm that there is positive correlation between resilience and various dimensions of PTG (r = 0.0394~0.745, P < 0.001). Since resilience could alleviate the negative effects brought by traumatic events, when individuals face intensive stress, resilience may contribute significantly to PTG[27]. Multiple linear regression analysis of PTG showed that, mental toughness of resilience (β=0.343, P<0.001) and strength

of resilience (β=0.256, P=0.01) could significantly predict the total score of PTG, which were independent influencing factors. Mental toughness and strength were deemed as precious qualities of personality traits. Another study published lastly revealed that resilience-competence was the only significant predictor of PTG-personal strength, appreciation of life, spiritual change new possibilities, and total PTG, while positive acceptance of change was a significant predictor of PTG relating to others[34]. Rzeszutek et al. found that receiving support and resilience were positively related to the PTG in a longitudinal study [39]. In other words, whereas a resilient person usually recovers from a traumatic event without psychological disturbances, PTG means unexpected transformation, displaying in a level of function which is higher than before the trauma [40].

LIMITATION

Our study has several limitations. First, the findings on the COVID-19 related cabin hospitalized patients were examined by cross-sectional data, and a causal relationship cannot be inferred. It is difficult to make causal inferences on the association without testing the long-term consequences of the COVID-19 pandemic. Second, the sample size of this study seems too small, that could result in unsteadiness conclusion. The longitudinal study with large sample needed to be conducted in the next step. Third, we only selected the cabin hospital patients as our participants, which is difficult to be representative of the whole population. Finally, data were collected from a convenience sample, and the response bias from participants is possible for the self-reported design.

CONCLUSION

Our results revealed that moderate to high PTG scores were found in COVID-19 survivors, of which the highest score was in the appreciation of life dimension, while the lowest was in the personal strength dimension. There was a significant positive correlation between social support, resilience and each dimension of PTG in cabin hospital patients. Henceforth, government should pay attention to not only the establishment of social support systems but also the implementation of resilience-building interventions. The most important implication of this study was that improving social support and resilience might be scientific intervention strategies for promoting PTG among COVID-19 survivors.

AUTHOR CONTRIBUTIONS

Conceptualization: Xiaojing Zhao, Weizhong Han. Data curation: Yan Hao, Wei Wang, Xiaoyang Hou, Yunchao Chen, Haitao Yuan, Xiaojing Zhao, Weizhong Han. Formal analysis: Yan Hao, Wei Wang, Yunchao Chen, Xiaoyang Hou. Methodology: Yan Hao, Wei Wang, Haitao Yuan, Weizhong Han. Visualization: Xiaojing Zhao, Yan Hao, Wei Wang, Weizhong Han. Writing—original draft: Yan Hao, Wei Wang. Writing-review & editing: Haitao Yuan, Xiaojing Zhao, Weizhong Han. Wang Wei, as co-first author, was involved in the conducting, analyzing, and reporting of the study.

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