



Post-traumatic growth in adult patients with systemic lupus erythematosus: a cross-sectional study in China

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Abstract

This cross-sectional study aims to evaluate the post-traumatic growth (PTG) level and explores its predictors among adult patients with SLE in China. From April 2020 to April 2021, 135 hospitalized adult SLE patients completed the questionnaire including sociodemographic and disease-related data, Post-traumatic Growth Inventory (PTGI), Medical Coping Modes Questionnaire (MCMQ), Social Support Rating Scale (SSRS), Pittsburgh Sleep Quality Index (PSQI), Hospital Anxiety and Depression Scale (HADS), and Self-Perceived Burden Scale (SPBS). Descriptive analysis, Pearson's correlation analysis, and forward multiple line regression analysis were used for analysis by SPSS 22.0. Results showed that, the mean PTGI score was 57.52 ± 20.82 . Pearson correlation analysis showed that, complicated autoimmune hemolytic anemia ($r = -0.185$), CD4+/CD8+ ($r = -0.383$), acceptance-resignation ($r = -0.185$), poor PSQI ($r = -0.215$), and depression ($r = -0.322$) were negatively associated with total PTGI score; while the relationship with lupus nephritis ($r = 0.247$), confrontation ($r = 0.313$), avoidance ($r = 0.379$), and SSRS ($r = 0.242$) were positive (all $P < 0.05$). The total score of PTGI and its five sub-dimensions were not correlated with anxiety and self-perceived burden. Further, CD4+/CD8+, confrontation of MCMQ, and SSRS could explain 30.3% of the variance in total PTGI ($F = 6.646$, $P < 0.01$). In summary, Chinese adults with SLE experience moderate levels of PTG. Clinical nurses need pay attention to the current disease status and individual characteristics of patients, as well as their mental health, to promote their growth experience, so that they can cope with the future life in a better state and coexist well with SLE.

Keywords Systemic lupus erythematosus · Post-traumatic growth · Coping strategy · Social support · Mental health

Introduction

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease of unknown etiology, characterized by the involvement of multiple organs, such as skin, joints, kidneys, lungs, central nervous system, and hematopoietic system, and linked to the production of autoantibodies leading to inflammation [1, 2]. SLE occurs commonly in women of

child-bearing age (approximately 9:1 female to male) [3], with the prevalence ranging from 0 to 241/100,000 people [4]. In China, it generally affects 38.6 in every 100,000 individuals. Emerging data show that the prevalence of SLE is rising over time, and now SLE is one of the leading causes of death in young women [5]. Conventional therapies include oral glucocorticoids, antimalarial and/or immunosuppressive therapies to control inflammation [6].

While remission is an achievable outcome, it may seldom be reached or sustained with the current therapies [1]. It has been reported that the clinical response rate and complete response rate of SLE patients in China were only 3.2% and 2.8%, respectively [7]. This implies that disease burden with SLE remains high and patients often experiencing significant work disability due to the need for repeated treatment [6]. Thus, being diagnosed with SLE can be a traumatic experience for patients. It has been reported that those negative changes, such as anxiety (72%), depression (70%), and ensuing challenges in sleeping (79%), were commonly observed

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in SLE patients [8]. However, at the same time, a growing body of evidence has documented positive post-traumatic changes known as post-traumatic growth (PTG).

PTG refers to positive psychological change experienced as a result of the struggle with highly challenging life circumstances [9]. Previous research indicates that more perceived growth in the months or years following negative life events may be associated with long-term health outcomes, such as decreased morbidity, mortality, and psychological distress [10]. Thus, it is necessary to understand person's PTG level. Empirical evidence has demonstrated that PTG can be observed among patients with rheumatoid arthritis and multiple sclerosis, two kinds of autoimmune disease [11]. This means that patients with autoimmune disease may experience varying levels of PTG. Given that exploring PTG is consistent with the salutogenic approach that calls for a positive orientation toward health, rather than a focus on the origins of disease, in seeking to promote and maintain physical and mental well-being [12], it is of great significance to evaluate PTG level in patients with SLE, one of the most common autoimmune disease. Nonetheless, PTG in SLE has received little attention. The only study related to PTG in lupus was conducted in 2001 by Katz et al. [13] in USA. They compared the differences of PTG between 56 cancer patients and 31 lupus patients in US, found that lupus patients were more demoralized and reported fewer benefits from their illness than cancer patients. It is important to note that this study included patients with lupus. Considering that lupus has four categories, namely SLE, cutaneous lupus, drug-induced lupus, and neonatal lupus; PTG of SLE patients cannot be accurately extracted. In addition, after 20 years of rapid development of medical technology, it is unknown whether the PTG of SLE patients in today's era has changed, as well as its level among Chinese patients.

Therefore, this study aims to evaluate the PTG level and explore its predictors among patients with SLE. Hope this study play a key role in promoting the possibility of PTG in SLE patients.

Methods

Participants

In this cross-sectional study, patients hospitalized in Department of Rheumatology, The First Affiliated Hospital of Soochow University in China from April 2020 to April 2021, fulfilled the 1997 American College of Rheumatology revised criteria for the classification of SLE [14], and willing to participate in were selected as the research objects. Patients who were < 18 years old, diagnosed with severe mental or life-threatening disorders were excluded from this research. This survey was approved by the Medical Ethics

Committee of The First Affiliated hospital of Soochow University (2021023), on March 1st, 2021, and written informed consent statement were obtained from each participant.

Demographics and clinical characteristics

Demographic variables contained the following: age, gender, body mass index (BMI), education, occupation, monthly income, place of residence, marital status, number of children, smoking, drinking, and medical insurance.

Clinical variables included comorbidity, disease duration, number of hospitalizations, and blood examination. Venous blood of 3 ml was collected from all patients in the morning under fasting condition. Centrifugation at 3000 R/min for 10 min. The upper layer of serum was stored at -80°C . Factor B, IgG, IgA, IgM, complement 3 and 4, Kappa- and Lambda-light chain were detected by nephelometry immunoassay. Additionally, anticoagulant whole blood was incubated with CD3-FITC, CD4-PC7, CD8-APC-Cy7 fluorescent antibodies at 4°C for 30 min. Then, lysate red blood cells with potassium chloride buffer, wash, fix for flow cytometry.

Clinical measurements

Post-traumatic Growth (PTG) was measured by the 20-item Chinese Version of Post-traumatic Growth Inventory (C-PTGI) [15], which was adapted from the Post-traumatic Growth Inventory [16]. C-PTGI comprised of the following five subscales: relating to others (RO), new possibilities (NP), personal strength (PS), spiritual change (SC), and appreciation for life (AL). Each item was answered on a 6-point Likert scale from 0 (strongly disagree)-5 (strongly agree), with total scores ranging from 0 to 100 and high scores indicating high PTG.

Coping strategy was measured by Medical Coping Modes Questionnaire (MCMQ), which was originally invented by Feifel [17], and the Chinese version was revised by Shen et al. [18]. The MCMQ Chinese version consists of 20 items, covering three dimensions: confrontation (8 items), avoidance (7 items), and acceptance-resignation (5 items). All the items were rated on a 4-point Likert scale ranging from 1 (never) to 4 (very often). The score for each coping strategy was calculated separately, and higher scores indicate that individuals are more inclined to use that coping strategy.

Social support was determined by the Social Support Rating Scale (SSRS), which was developed for the Chinese population by Xiao in 1994 [19]. The scale includes 10 items that measure 3 dimensions: subjective support (4 items), objective support (3 items), and support utilization (3 items). The total score ranges from 12 to 66. A higher score represents more social support.

Sleep quality was evaluated by Pittsburgh Sleep Quality Index (PSQI), which is a self-rated questionnaire developed by Buysse et al. [20] in 1989. PSQI consists of 19 items in 7 dimensions: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total score ranges from 0 to 21, and the scores > 5 were defined as poor sleep quality.

Anxiety and depression were measured by Hospital Anxiety and Depression Scale (HADS), which was developed by Zigmond et al. [21], and translated by Leung et al. [22]. This scale contains 14 items, with seven items assessing depression and seven items assessing anxiety on a 4-point Likert scale. Total score of either subscale is ranging from 0 to 21. Patients with a score ≥ 8 , on either subscale, was considered to have clinically significant anxiety or depression.

Self-perceived burden (SPB) was measured by Self-Perceived Burden Scale (SPBS), which was developed by Cousineau et al. in 2003 [23], and translated by Wu et al. [24]. This scale consists of 10 items, including three dimensions of body burden, emotional burden, and economic burden. Each item is scored on a five-point Likert scale, from 1 (never) to 5 (always). Total SPBS score is defined as the sum of the individual items (the eighth item is scored in reverse), and higher scores indicate heavier burden.

Data analysis

Statistical analysis was performed using SPSS 21.0. Categorical variables will be described by frequency (percentage). For continuous variables, Kolmogorov–Smirnov test was used to conduct normality assessment, with $P > 0.05$ indicating normal distribution. Continuous variables with normal distribution will be described by mean \pm standard deviation (SD), others will be described by median (Min–Max). The relationship between variables and PTGI, the five sub-dimensions of PTGI were first tested by Pearson correlation analysis. Then, variables with a significant association with PTGI and the five sub-dimensions were entered into a forward stepwise multivariate linear regression model to test the significant predictors of PTGI, as well as the five sub-dimensions of PTGI, respectively, with the criteria that included if $P < 0.05$ or removed if $P > 0.10$. The statistically significant level was 0.05, two-tailed.

Results

Descriptive statistics

The descriptive statistics for all study variables are shown in Table 1. Of the 137 participants, the response rate was 100%, and 135 eligible patients were included in the final

analysis (2 were less than 18 years old). The mean age was 39.13 ± 13.30 . Female accounted for 94.1%. Lupus nephritis (LN) was present in 36.3% of 135 adult SLE patients, idiopathic thrombocytopenic purpura (ITP) in 14.8%. 59.3% of patients reported poor sleep quality. The prevalence of anxiety and depression among the 135 adult SLE patients was 41.5% and 36.3%, respectively. The SSRS score was 38.87 ± 6.70 , and the SPB was 30.20 ± 7.69 .

The total PTGI score was 57.52 ± 20.82 , for the 5 dimensions, RO was 8.87 ± 3.75 , NP was 10.27 ± 5.20 , PS was 9.47 ± 3.73 , SC was 9.61 ± 4.43 , AL was 19.29 ± 6.93 (Fig. 1). This suggests that adult SLE patients have moderate level of PTG.

Correlation between PTGI and variables

Table 1 also displayed the relationship between PTGI and variables. Pearson correlation analysis showed that, complicated AIHA ($r = -0.185$, $P < 0.05$), CD4+/CD8+ ($r = -0.383$, $P < 0.05$), acceptance-resignation ($r = -0.185$, $P < 0.05$), poor PSQI ($r = -0.215$, $P < 0.05$), and depression ($r = -0.322$, $P < 0.01$) were negatively associated with total PTGI score; while the relationship with complicated LN ($r = 0.247$, $P < 0.01$), confrontation ($r = 0.313$, $P < 0.01$), avoidance ($r = 0.379$, $P < 0.01$), and SSRS ($r = 0.242$, $P < 0.01$) was positive. The total score of PTGI and its five sub-dimensions were not correlated with anxiety and self-perceived burden ($P > 0.05$).

Predictors of PTGI

The forward multiple line regression analysis revealed that CD4+/CD8+, confrontation, and SSRS could explain 30.3% of the variance in total PTGI ($F = 6.646$, $P < 0.01$). For the dimensions of PTGI, BMI, Factor B level, avoidance, and SSRS could explain 22.1% of the variance in RO ($F = 8.993$, $P < 0.01$); complicated LN, marital status, confrontation, avoidance, and acceptance-resignation could explain 24.6% of the variance in NP ($F = 9.733$, $P < 0.01$); CD3+, CD4+/CD8+, and PSQI could explain 27.8% of the variance in PS ($F = 6.013$, $P < 0.01$); drinking, kappa-light chain, CD4+/CD8+, and confrontation could explain 41.5% of the variance in SC ($F = 7.920$, $P < 0.01$); monthly income, CD4+/CD8+, and SSRS could explain 27.5% of the variance in AL ($F = 5.815$, $P < 0.01$) (Table 2).

Discussion

This study explored PTG among Chinese adult patients with SLE, and found that, while patients underwent negative induced emotion, such as depression (36.3%) and anxiety (41.5%), they also experienced moderate levels of PTG

Table 1 Pearson correlation between PTGI and study variables ($N=135$)

Variable	Mean \pm SD	Median (Min, Max)	N (%)	Dimensions of PTGI					PTGI total
				RO	NP	PS	SC	AL	
Age	39.13 \pm 13.30			0.171*	0.029	0.029	0.106	0.052	0.083
Gender, female			127 (94.1)	0.034	0.029	-0.049	-0.007	-0.042	-0.011
BMI				0.173*	0.109	-0.021	-0.020	-0.018	0.044
< 18.5			21 (15.6)						
18.5–23.9			81 (60.0)						
\geq 24			33 (24.4)						
Education				-0.117	0.038	-0.051	-0.105	0.008	-0.041
\leq 9 years			68 (50.4)						
> 9 years			67 (49.6)						
Occupation				0.131	0.100	0.093	0.159	0.108	0.135
Employment			64 (47.4)						
Unemployment			71 (52.6)						
Monthly income				0.040	0.155	0.075	0.142	0.214*	0.161
< 5000			93 (68.9)						
\geq 5000			41 (30.4)						
Place of residence				-0.053	-0.112	-0.055	-0.017	-0.047	-0.067
Urban			90 (66.7)						
Town			22 (16.3)						
Rural			23 (17.0)						
Marital status				-0.066	-0.170*	-0.123	-0.130	-0.105	-0.139
Married			110 (81.5)						
Unmarried			21 (15.6)						
Divorce			2 (1.5)						
Widowed			1 (0.7)						
Number of children		1 (0, 3)		0.086	0.042	0.027	0.079	0.055	0.066
Smoking, yes			3 (2.2)	0.032	0.041	-0.060	0.025	-0.028	0.001
Drinking, yes			3 (2.2)	0.086	0.157	0.129	0.207*	0.117	0.161
Medical insurance, yes			106 (78.5)	0.008	0.070	-0.068	-0.001	-0.036	-0.005
Comorbidity									
ITP, yes			20 (14.8)	-0.075	-0.054	0.048	-0.053	0.022	-0.022
AIHA, yes			3 (2.2)	-0.076	-0.153	-0.141	-0.192*	-0.203*	-0.185*
ILD, yes			4 (3.0)	0.100	0.067	0.048	0.075	0.012	0.063
LN, yes			49 (36.3)	0.141	0.250**	0.185*	0.230**	0.232**	0.247**
Disease duration	6.79 \pm 7.43			0.072	-0.082	0.015	0.039	-0.016	-0.002
Number of hospitalizations		3 (1, 10)		-0.166	-0.110	-0.115	-0.098	-0.124	-0.140
Blood examination									
Factor B (mg/dL)	27.17 \pm 9.17			-0.189*	-0.101	-0.103	-0.064	-0.106	-0.127
IgG (g/L)	15.07 \pm 6.96			-0.100	-0.058	0.060	-0.097	0.030	-0.031
IgA (g/L)	2.42 \pm 1.25			0.151	0.082	0.026	0.118	0.136	0.122
IgM (g/L)		0.82 (0.22, 3.22)		-0.089	-0.175	-0.067	-0.163	-0.087	-0.134
Complement 3 (g/L)	0.62 \pm 0.25			-0.023	-0.017	-0.014	-0.022	-0.029	-0.025
Complement 4 (g/L)	0.13 \pm 0.07			-0.026	-0.056	-0.039	0.021	-0.055	-0.040
Kappa-light chain (mg/dL)	1226.82 \pm 523.24			-0.178	-0.123	0.020	-0.184*	-0.034	-0.109

Table 1 (continued)

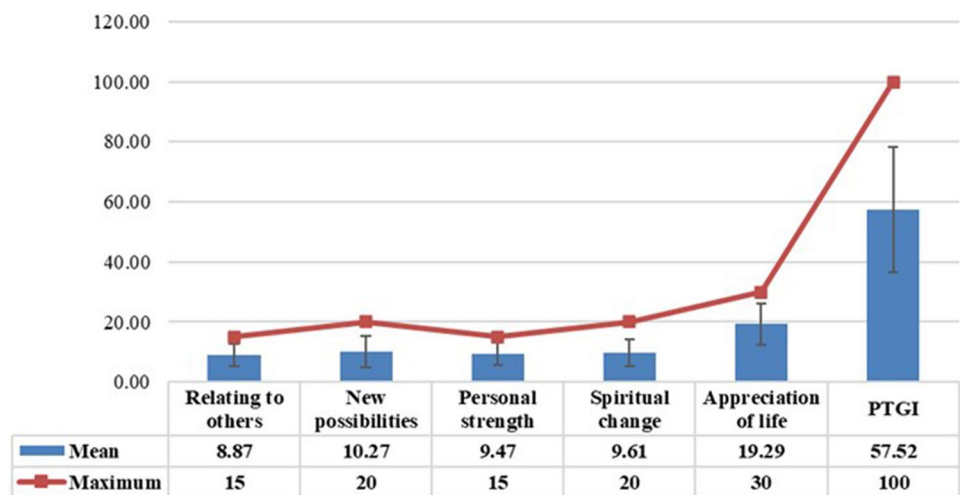
Variable	Mean ± SD	Median (Min, Max)	N (%)	Dimensions of PTGI					PTGI total
				RO	NP	PS	SC	AL	
Lambda-light chain (mg/dL)	709.88 ± 335.37			-0.016	-0.038	0.077	-0.033	0.078	0.021
CD3+ (%)	74.60 ^a			0.091	0.128	0.333*	0.113	0.170	0.196
CD3+CD4+ (%)	30.35 ^a			-0.026	-0.265	-0.233	-0.364*	-0.281	-0.295
CD3+CD8+ (%)		42.05 (14.35, 275.00)		0.114	0.259	0.307	0.341*	0.166	0.280
CD4+/CD8+		0.75 (0.27, 3.75)		-0.054	-0.294	-0.448**	-0.365*	-0.387*	-0.383*
Coping strategy									
Confrontation		19 (14, 27)		0.236**	0.308**	0.277**	0.274**	0.257**	0.313**
Avoidance		17 (12, 26)		0.305**	0.326**	0.350**	0.257**	0.376**	0.379**
Acceptance-resignation	11.32 ± 2.43			-0.131	-0.234**	-0.158	-0.090	-0.166	-0.185*
SSRS	38.87 ± 6.70			0.212*	0.258**	0.120	0.199*	0.228**	0.242**
PSQI, poor			80 (59.3)	-0.093	-0.202*	-0.235**	-0.155	-0.219*	-0.215*
Anxiety, yes			56 (41.5)	-0.141	-0.142	-0.140	-0.070	-0.122	-0.141
Depression, yes			49 (36.3)	-0.226**	-0.295**	-0.324**	-0.235**	-0.299**	-0.322**
SPBS	30.20 ± 7.96			0.037	-0.023	-0.032	0.037	0.074	0.028

*P < 0.05, **P < 0.01

^aThe value was presented as mean

BMI body mass index, ITP idiopathic thrombocytopenic purpura, AIHA autoimmune hemolytic anemia, ILD interstitial lung disease, LN lupus nephritis, SPBS self-perceived burden scale, SSRS social support rating scale, PSQI Pittsburgh sleep quality index, SD standard deviation, RO relating to others, NP new possibilities, PS personal strength, SC spiritual change, AL appreciation of life, PTGI post-traumatic growth inventory

Fig. 1 Mean ± SD and maximum of the Post-traumatic Growth Inventory (N = 135)



(57.52 ± 20.82). This was less than that of patients with inflammatory bowel disease (61.36 ± 26.91) [12], another autoimmune disease, but higher than that in Chinese coronary artery disease patients (36.8 ± 21.6) [25], a kind of chronic disease. This indicates that among patients with chronic disease, the PTG of adult SLE patients is at a moderate level. Pearson correlation analysis showed that, complicated AIHA, complicated LN, coping strategy, poor sleep quality, depression, social support, and the level of CD4 +/

CD8 + were associated with PTG in adult SLE patients. Further forward multiple line regression analysis retained confrontation of coping strategy, CD4 +/CD8 + ratio, and social support. To our knowledge, this research was the first to investigate PTG and its predictors among adult SLE patients in China.

The exploration of risk and protective factors for PTG in adult patients with SLE yielded significant findings. That there is association between coping strategy and PTG among

Table 2 Forward multivariate line regression analysis of predictors of PTGI and its dimensions

Variable	β	SE	<i>T</i>	<i>P</i>	<i>R</i> ²	Adjusted <i>R</i> ²	<i>F</i>
PTGI							
CD4+/CD8+	- 11.376	3.733	- 3.047	0.004**	0.356	0.303	6.646**
Confrontation	1.837	0.860	2.137	0.039*			
SSRS	0.708	0.398	1.781	0.083			
Relating to others (RO)							
BMI ^a	1.556	0.529	2.940	0.004**	0.248	0.221	8.993**
Factor B	- 0.087	0.035	- 2.481	0.015*			
Avoidance	0.428	0.113	3.794	< 0.01**			
SSRS	0.100	0.047	2.109	0.037*			
New possibilities (NP)							
LN	1.830	0.843	2.171	0.032*	0.274	0.246	9.733**
Marital status ^b	- 2.088	0.784	- 2.664	0.009**			
Confrontation	0.290	0.120	2.407	0.018*			
Avoidance	0.473	0.151	3.126	0.002**			
Acceptance-resignation	- 0.484	0.165	- 2.930	0.004**			
Personal strength (PS)							
CD3+	0.099	0.048	2.059	0.047*	0.334	0.278	6.013**
CD4+/CD8+	- 1.753	0.745	- 2.353	0.024*			
PSQI ^c	- 2.202	0.984	- 2.237	0.032*			
Spiritual change (SC)							
Drinking ^d	5.874	2.447	2.400	0.022*	0.475	0.415	7.920**
Kappa-light chain	- 0.003	0.001	- 2.911	0.006**			
CD4+/CD8+	- 2.492	0.769	- 3.241	0.003**			
Confrontation	0.426	0.169	2.519	0.016*			
Appreciation of life (AL)							
Monthly income ^e	3.402	1.791	1.899	0.066	0.333	0.275	5.815**
CD4+/CD8+	- 3.153	1.277	- 2.470	0.019*			
SSRS	0.298	0.126	2.362	0.024*			

* $P < 0.05$, ** $P < 0.01$

PTGI post-traumatic growth inventory, SSRS social support rating scale, BMI body mass index, LN lupus nephritis, PSQI Pittsburgh sleep quality index, SE standard error

^a0 ≤ 18.5, 1 = 18.5–23.9, 2 ≥ 24; ^b0 = married, 1 = unmarried, 2 = divorce, 3 = widowed; ^c0 = good, 1 = poor; ^d0 = no, 1 = yes; ^e0 ≤ 5000, 1 ≥ 5000

Chinese adult patients diagnosed with SLE. In details, confrontation and avoidance were positively predictive of PTG, while acceptance-resignation being the negatively predictive. The findings were consistent with earlier study focus on other chronic disease [26]. Feifel et al. [17] argue that confrontation is generally considered a positive and beneficial coping strategy, and that greater use of confrontation is characteristic of those who perceive their illness as serious. This is also reported by Du et al. [27], that positive coping strategies can relieve stress, promote communication, and have a significant effect by improving mental status and healthy behaviors. Another explanation is that confrontation can help patients adapt more effectively to changes in stress and return to stable health more quickly, and may enhance resilience by influencing feelings of self-efficacy and hope, creating a sense of peace and meaning [28], and thus

promote PTG among adult patients diagnosed with SLE. It is very interesting that avoidance is the protective factor of PTG. The possible explanation is that short-term avoidance protects their spiritual world, helps them face the truth of events, facilitates psychological adjustment and increases the likelihood of promoting positive change [26]. Additionally, acceptance-resignation was found to be the negatively predictive of PTG among adult SLE patients. Patients who use accept-resignation as the coping strategy might believe that their illness cannot be resolved, and when confronting it, they are unable to take any action, with an increased feeling of helplessness [29]. Another possible explanation is that acceptance-resignation might put patients in a negative mood in the long run, affect their initiative [30], thus reduce their positive psychological changes-PTG. Therefore, it is suggested that medical staff strengthen the psychological

guidance of adult SLE patients and guide them to adopt positive coping styles to enhance PTG.

And one of the things that we found in particular, the CD4+/CD8+ ratio was the negatively predictive of SLE among adult patients with SLE in China ($\beta = -11.376$, Standard Error = 3.733, $P = 0.004$). Immunologically, the main potential pathogenesis of SLE is the destruction of tolerance of T and B lymphocytes and the production of large amounts of autoantibodies by self-reactive B cells [31]. Among them, T cells play an indispensable role in promoting the occurrence and development of SLE. T cells can be divided into two subpopulations of CD4+ T cells and CD8+ T cells according to the expression levels of CD4 and CD8 surface molecules [31]. An overactive immune response in SLE induces an inverted t-lymphocyte ratio. Increased T lymphocyte activation can lead to cell depletion and show some characteristics of CD4+/CD8+ ratio inversion [32]. Under normal physiological conditions, the CD4/CD8 ratio is higher than 1, while 0.91 ± 0.68 in this study. The possible reason is that all the adult SLE patients included in this study were hospitalized with a long course of disease (6.79 ± 7.43 years). Hospitalization means that most patients were in the active stage of disease with abnormal indicators. Long-term coexisting with SLE made them relatively adaptable to those abnormal. For them, the purpose of hospitalization is to relieve symptoms and control the disease, to achieve better survival and positive psychological experience. Therefore, when the CD4+/CD8+ ratio increases or even reaches the normal value, patients still need to be hospitalized, which may cause negative emotions, such as “Why do I still feel uncomfortable and need to be hospitalized even when this index is normal?”, which in turn weakens the positive effect, such as PTG. This suggests that when clinical staff focus on hospitalized SLE patients with abnormal indicators, they should also pay attention to the psychological state of patients with normal indicators.

We also found social support was positively related to the level of PTG in Chinese adults with SLE ($r = 0.242$, $P < 0.01$), although not significantly in the regression analysis. Social support is affected by culture, socioeconomic factors, and policies and impacts health through health behavioral pathways or psychological pathways [33]. It has been empirically demonstrated that social support plays an important role in the transition from trauma to growth, because it activates the cognitive processes that promote PTG [34]. In the case of Chinese adults with SLE, possessing a supportive environment, having the opportunity to self-disclose and receiving help may be especially valuable. Different from western culture, which attaches great importance to individual value and forms the principle of “individual standard”, China advocates group culture and attaches great importance to human social value, forming the principle of “obligation

standard”. In addition, China’s group culture has given rise to the group principle, which enforces individual obligations and responsibilities. As a result, China has formed the custom of helping each other when they meet problems, and family members, relatives and friends are relatively close to each other. Therefore, it is necessary to focus on establishing a good social support network. Given the view of positive correlation with RO and AL, two dimensions of PTG, it is necessary to pay attention to the establishment and maintenance of a good social support network, to help activate and promote the cognitive process of PTG in Chinese adult SLE patients.

The limitations of this study are as follows: (1) Single center and small sample have certain impact on the representativeness of the results. However, considering that the data were collected in the first year of COVID-19 in China, and the number of hospitalized patients was strictly controlled at that time, this study to some extent reflects the psychological status of hospitalized SLE patients under the epidemic situation. (2) Due to cross-sectional study design, causality cannot be proved. Since there are no published studies related to PTG in SLE patients in China, it is necessary to use a cross-sectional design to understand the existing status. Future longitudinal studies could be carried out to explore causal links. (3) Subjective measurement tools were used for PTG, coping style, social support, anxiety, depression, sleep quality and self-perceived burden.

Conclusion

Chinese adults with SLE experience moderate levels of PTG. Confrontation of coping strategy and CD4+/CD8+ were the predictors of PTG. Clinical nurses are thus suggested to pay attention to the current disease status and individual characteristics of patients, as well as their mental health, to promote their growth experience, so that they can cope with the future life in a better state and coexist well with SLE.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00296-022-05233-x>.

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Data availability All data generated or analyzed during this study are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors declared that they have no conflicts of interests.

Ethical statement This survey was approved by the Medical Ethics Committee of The First Affiliated Hospital of Soochow University (2021023).

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