

Original Article

Factors associated with psychological resilience in patients with chronic heart failure and efficacy of psycho-cardiology intervention

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Abstract: Objective: To explore the value of psycho-cardiology intervention on psychological resilience in patients with chronic heart failure (CHF) and investigate the associated factors. Methods: A retrospective study of 142 patients with CHF was carried out. These patients were admitted to the Department of Cardiology, Provincial Clinical Medical College of Fujian Medical University from January 2017 to January 2021. They were grouped according to intervention method, including 74 patients with psycho-cardiology intervention and 68 with conventional intervention. The psychological resilience and the levels of anxiety and depression before and after intervention were assessed with the Connor-Davidson resilience scale (CD-RISC), self-rating anxiety scale (SAS), and self-rating depression scale (SDS), respectively. The factors associated with psychological resilience in patients with CHF were observed. The relationship between psychological resilience and SAS scores before intervention was studied. Results: Using multivariate logistic regression analysis, we found that age (OR (95% CI): 3.452 (0.862-4.872), P=0.015), gender (OR, (95% CI): 3.389 (0.872-5.023), P=0.035), SAS score (OR (95% CI) 5.433 (1.543-14.333), P=0.027) and SDS score (OR (95% CI): 5.654 (1.572-15.823), P=0.021) were factors associated with psychological resilience in patients with CHF (all P<0.05). The average CD-RISC scores were 56.55±8.89 points in patients with CHF. The psychological resilience was inversely correlated with SAS score (r=-0.450, P<0.001) and SDS scores (r=-0.401, P<0.001). The CD-RISC scores of the observation group after intervention were higher than before intervention and higher than the control group, while SAS and SDS scores were decreased (all P<0.05). Conclusion: Age, gender, SAS, and SDS scores are factors associated with psychological resilience in patients with CHF. Psychological resilience was inversely associated with both anxiety and depression. Psycho-cardiology intervention can improve patients' psychological resilience, and reduce their anxiety and depression.

keywords: Chronic heart failure, psychological resilience, psycho-cardiology intervention, anxiety, depression, associated factors

Introduction

Chronic heart failure (CHF) is the terminal stage of various heart diseases, frequently seen in elderly patients [1, 2]. At present, there are about 23 million patients with CHF worldwide, with numbers increasing every year [3]. The prevalence of CHF is 0.9% in China, and the 5-year survival rate is about 50%, which is similar to that of patients with malignant tumors [4]. With the rapid development of psychosomatic medicine, the psycho-cardiology problems of CHF patients have become a clinical concern. Studies have shown that patients with

CHF have negative emotional distress, and some have anxiety or depression [5]. 32% of patients with CHF have a significant increase in anxiety from foreign studies [6]. A study involving 5.5 million patients in Denmark showed that patients with severe anxiety or depression had a significantly higher incidence of cardiovascular disease than the general population [7]. Thus, when evaluating symptoms of CHF patients, we should also pay attention to their mental health [8]. Psychological resilience refers to the process of an individual's adaptation in the face of hardships and dangers, and evaluates patients' adaptabilities and attitudes

towards disease [9, 10]. It has been reported that psychological resilience is negatively correlated with anxiety or depression [11]. Currently, there are many studies on the factors affecting psychological resilience in patients with CHF, but psycho-cardiology intervention is rarely mentioned. In view of this, the aim of this study was to explore the factors associated with psychological resilience and observe the effects of psycho-cardiology intervention on psychological resilience, anxiety, and depression in patients with CHF.

Materials and methods

General data

This study was approved by the Ethics Committee of Fujian Provincial Hospital. A retrospective study of 142 patients with CHF was carried out. These patients were admitted to the Department of Cardiology, Provincial Clinical Medical College of Fujian Medical University from January 2017 to January 2021. The psychological resilience and the levels of anxiety and depression were assessed in all patients. The intervention methods were chosen based on the assessment and the results after communicating with the patients, including psycho-cardiology intervention (n=74) and conventional intervention (n=68). The patients were aged from 33 to 75 years old, with an average age of 56.3 ± 8.4 years old.

Inclusion criteria: (1) Patients' conditions met the diagnostic criteria for CHF [12]. (2) Patients were aged over 18 years old. (3) Patients could move autonomously.

Exclusion criteria: (1) Patients' clinical data were incomplete. (2) Patients had severe kidney or liver failure. (3) Patients had mental disorders or cerebrovascular diseases and did not cooperate. (4) Patients were lost to follow-up. (5) Patients had concomitant malignancy.

Methods

The general and clinical data of patients were collected. Patients in the control group received conventional intervention during treatment. After admission, the patients were educated on health, related causes of CHF, clinical symptoms, common complications, treatment plans, bed rest during the onset period, reasonable diet, edema, daily urination, and taking medica-

tion according to medical advice. Patients were treated with drugs according to their condition following the principles of CHF treatment (cardiac muscle stimulation, diuresis, and vasodilation). Patients were given exercise guidance when in stable remission. Patients were guided to avoid strenuous defecation and vigorous exercise in daily life. Patients should take the medication as prescribed. Patients received health guidance during follow-up after discharge.

Patients in the observation group received psycho-cardiology intervention based on conventional intervention [13]. A care team for psycho-cardiology intervention was established. It was composed of medical staff in the cardiology and psychiatry departments. The team was divided into 3 groups. Namely, the section chief and the head nurse formed a decision-making group, responsible for the management and supervision of patient communication and implementation plans. The program-making group was composed of two psychiatrists, who conducted a psychological assessment and formulated psychological treatment plans in combination with clinical practice for patients. The implementation team consisted of 2 doctors and 2 nurses with counseling certification, in charge of the implementation of the psycho-cardiology intervention program. (1) Cognitive behavioral therapy: The medical staff correct patients' misconceptions of the disease, improve their compliance, and enhance their confidence in overcoming the disease. Meanwhile, by knowing each patient's daily habits and physical and mental state, the medical staff gave individualized professional behavior and lifestyle guidance, such as regular work and rest, smoking and alcohol restrictions, diet with low fat and salt, avoidance of drinking strong tea, working and resting on time, strictly following doctors' suggestions, abandoning bad habits, and choosing a reasonable lifestyle. It was necessary to enlist the patient's family and friends in the role of social support, popularize the correct knowledge of disease health for the patient's family and friends, improve the professional cognition of the family, reduce their psychological pressure, guide them to urge the patient to insist on taking medication, pay attention to the changes in patient's psychological state, give encouragement and care to the patient, and reduce the patient's sense of guilt and self-blame for wor-

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rying about the disease dragging down the family, so that the patients could adjust mentally and correctly treat the disease and improve their life. (2) Relaxation training: Progressive muscle relaxation training was performed in the group, once every 2 days after surgery for 30 min until the patient was discharged from the hospital. A classroom with soft light and a quiet environment were used as the training place. Before training, the patients emptied their bowels, loosened the clothes, and sat on the chair with ease and comfort. The instructions were gentle and uniform with slow and soft music, to instruct patients to perform contraction-relaxation training in various parts of the body, and were repeated several times. At the same time, patients were instructed to carry out simple breathing relaxation exercises, perform breathing relaxation training twice a day, and adhere to it for another month after discharge. (3) Drugs for anxiety and depression: According to the patients' levels of anxiety and depression, drug therapy was given under the guidance of a psychiatrist. (4) WeChat group and follow-up management after discharge: A public account on WeChat managed by 2 nursing staff was set up. The following content was produced in videos to educate patients, including the causes, symptoms, and treatment methods of coronary heart disease; the precautions for the treatment of heart failure, such as patients' daily activities, diet, and medication. The identification of and counseling methods for psychological problems such as anxiety, depression, and somatic symptoms were pursued. There were a total of 10 videos, with each of about 10-15 min. The videos would be updated every 3 days. Videos were circulated until the last patient watched all the videos. The WeChat group was managed by a cardiologist and a psychiatrist who were responsible for answering questions raised by patients and their families as soon as possible in their free time. At the same time, patients could communicate and share experiences in the WeChat group.

Outcome measures

Univariate ANOVA and multivariate logistic regression analyses were used to analyze the factors related to psychological resilience in patients with CHF.

CD-RISC, SAS, and SDS scores before intervention were measured. The correlation between

the CD-RISC and SAS scores, as well as the CD-RISC and SDS scores were studied.

The effects of psycho-cardiology intervention on patients' psychological resilience, SAS scores, and SDS scores were compared before and after intervention. SAS and SDS were applied to evaluate the degree of anxiety and depression of patients. CD-RISC was used to evaluate the patient's psychological resilience to external pressure.

SAS was used to assess the frequency of anxiety symptoms, including 20 items, using a 4-point scale. One indicated none, or seldom; 2 meant sometimes; 3 indicated most of the time; 4 represented most, or all the time. Among the 20 items, 15 items were stated in negative terms, and the remaining 5 items were stated in positive terms. The total raw score was the sum of the 20 items. The standardized score was the integer part of the results from raw score multiplying 1.25, with a cut-off value of 50 points and a total score of 80 points [6].

SDS was employed to assess the frequency of depression symptoms, using a 4-point scale ranging from 1 (none, or a little of the time) to 4 (most, or all of the time). There were 20 items: psychotic affective symptoms (2 items), somatic disorders (8 items), psychomotor disorders (2 items) and depressed psychological disorders (8 items). Similar to SAS, 15 items are stated in negative terms, and the remaining 5 items were stated in positive words. The total raw score was the sum of the 20 items. The standardized score was the integer part of the results from raw score multiplying 1.25, with a cut-off value of 50 points and a total score of 80 points [6].

CD-RISC was used for measuring patients' resilience, which consisted of 14 items rated on a scale from 1 (poor) to 7 (good), with a total score of 100 points. Higher scores indicated better resilience [9].

Statistical analysis

SPSS 20.0 software was adopted for statistical analysis. Continuous variables were expressed as mean \pm standard deviation ($\bar{x} \pm sd$). The non-normally distributed data were expressed by median (M) values and interquartile range (P25-P75). For data with normal distribution and homogeneity of variance, an indepen-

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dent-group t test was carried out for a comparison of means between two groups. A paired samples t-test was used to compare the means of two measurements taken from the same group. Differences among groups were assessed using univariate ANOVA analysis of variance and Bonferroni test. The rank-sum test was used for data with non-normal distribution or heterogeneity of variance. Counted data were tested by Pearson's chi-square test and represented as χ^2 . Pearson's correlation was used to assess the association between two continuous variables. Logistic regression analysis was used to detect factors affecting psychological resilience in patients with CHF. Differences with *P*-values <0.05 were considered significant.

Results

Comparison of general data

No differences were observed in terms of age, gender, cardiac function classification, cause of disease, education level, marital status, methods of payment, monthly income, CD-RISC scores, SAS scores, or SDS scores between the two groups (all *P*>0.05). See **Table 1**.

Comparison of CD-RISC, SAS, and SDS scores after intervention

The CD-RISC scores of the observation group after intervention were higher than those before intervention and of the control group, respectively, while SAS, and SDS scores were decreased (all *P*<0.05). See **Table 2**.

Comparison of factors associated with psychological resilience in patients with CHF

The average CD-RISC score was 56.55±8.89 points in patients with CHF. Univariate analysis of psychological resilience in patients with CHF revealed that age, gender, education level, method of payment, monthly incomes, SAS, and SDS scores were factors associated with psychological resilience (all *P*<0.05). See **Table 3**.

Multivariate logistic regression analysis of psychological resilience in patients with CHF

Multivariate logistic regression analysis demonstrated that age, gender, SAS, and SDS scores were factors associated with psycho-

logical resilience in patients with CHF (all *P*<0.05). See **Tables 4, 5**.

Relationship between resilience and levels of anxiety, and depression

The psychological resilience score of patients with CHF was 56.55±8.89 points. The psychological resilience value was inversely correlated with SAS score (*r*=-0.450, *P*<0.001) and SDS score (*r*=-0.401, *P*<0.001). See **Figure 1**.

Discussion

Patients with CHF clinically present with up to 5-15 kinds of symptoms, whose presence leads to decreased physical function [8]. Even if in a stable phase, symptoms may appear and lead to a decline in quality of life [14, 15]. The decline in long-term physical function and the recurrence of symptoms have a great impact on patients' physical and mental health [16]. Negative emotions, such as anxiety and depression, often develop in patients with CHF, due to the influence of the disease. Hence, how to effectively eliminate negative emotions while increasing patients' psychological endurance is a subject of research. Psychological resilience is an individual's ability to adapt to the outside world, especially in coping with adversity or trauma [17]. Psychological resilience is a positive psychological quality formed by the combination of protective factors inside and outside. Previous studies have unveiled that patients with good psychological resilience are able to resolve negative emotions well and face the disease positively [18, 19].

Different patients have different factors associated with psychological resilience [20]. In this study, we concluded that age, gender, SAS, and SDS score were factors associated with psychological resilience in patients with CHF. The levels of psychological resilience vary among patients with CHF of different ages. One study revealed that a downward trend was found in psychological resilience of CHF patients with increasing age [21]. However, another study showed that younger patients were more prone to anxiety and depression than older patients with richer social experience, and had decreased psychological resilience [22]. In this study, psychological resilience levels rose with age. It was possible that older patients had a decrease

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Table 1. Comparison of general data (n)

Item	Observation group (n=74)	Control group (n=68)	χ^2 /t/F	P
Age (years)			2.318	0.314
18-40	11	5		
41-60	20	23		
≥ 61	43	40		
Gender (n)			2.106	0.147
Male	47	35		
Female	27	33		
Cardiac function classification (n)			1.940	0.164
Class I-II	8	13		
Class III-IV	66	55		
Cause				
Coronary disease	32	28	0.769	0.842
Rheumatic heart disease	6	5		
Dilated cardiomyopathy	5	4		
Hypertrophic cardiomyopathy	12	8		
Hyperthyroid heart disease	3	2		
Pulmonary heart disease	12	15		
Others	4	6		
Education level (n)			0.721	0.868
Elementary school or below	27	21		
Middle or high school	30	28		
College or Bachelor's	12	14		
Master's or above	5	5		
Marital status (n)			2.691	0.442
Unmarried	6	9		
Married	55	43		
Divorced	4	3		
Widowed	9	13		
Methods of payment (n)			0.514	0.473
Self-pay	19	14		
Medicare or commercial insurance	55	54		
Monthly incomes (yuan)			0.328	0.567
≥ 5000	47	40		
< 5000	27	28		
CD-RISC (point)			0.496	0.587
> 55	39	37		
≤ 55	35	31		
SAS (point)			0.230	0.632
< 50	29	24		
≥ 50	45	44		
SDS (point)			1.276	0.259
< 50	33	24		
≥ 50	41	44		

Note: χ^2 : data from chi-square statistics; t: data from t-tests; F: data from rank sum tests; CD-RISC: Connor-Davidson resilience scale; SDS: self-rating depression scale; SAS: self-rating anxiety scale. Connor-Davidson resilience scale, ≥ 70 points for good psychological resilience, < 70 for poor psychological resilience. Self-rating anxiety scale ≥ 50 points and self-rating depression scale ≥ 50 points indicated the occurrence of anxiety, and depression, respectively.

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Table 2. Comparison of CD-RISC, SAS, and SDS scores after intervention ($\bar{x} \pm sd$)

Item	Observation group Before intervention	Control group Before intervention	t	P	Observation group After intervention	Control group After intervention	t	P
CD-RISC (point)	57.23±8.92	55.82±8.87	0.941	0.349	62.72±9.37***	58.23±9.21	2.867	0.005
SAS (point)	57.22±9.47	55.31±9.46	1.199	0.232	50.23±9.02***	53.89±9.72	2.327	0.021
SDS (point)	58.61±9.38	57.93±9.40	0.431	0.667	49.82±7.83***	53.23±8.27	2.543	0.043

Note: t, data from t-test. Comparison with before intervention in the same group, ***P<0.001. CD-RISC: Connor-Davidson resilience scale; SDS: self-rating depression scale; SAS: self-rating anxiety scale.

Table 3. Comparison of factors associated with psychological resilience in patients with CHF ($\bar{x} \pm sd/n$)

Item	Case (n)	CD-RISC (score)	$\chi^2/t/F$	P
Age (years)			11.011	<0.001
18-40 years	16	50.23±6.72		
41-60 years	43	54.33±7.22 ^{aa}		
Over 61 years	83	59.23±8.72 ^{aaa,b}		
Gender (n)			3.556	0.001
Male	82	58.22±8.12		
Female	60	53.23±8.45		
Cardiac function classification (n)			1.338	0.183
Class I-II	21	57.23±8.06		
Class III-IV	121	54.64±8.21		
Education level (n)			3.306	0.022
Primary education and below	48	52.82±8.52		
Lower and upper secondary	58	54.38±7.82		
Bachelor's level	26	57.92±8.44 ^c		
Master's level or above	10	59.44±8.11 ^{ccc,dd}		
Marital status (n)			0.074	0.937
Unmarried	15	56.22±7.62		
Married	98	56.43±8.21		
Divorced	7	55.22±4.32		
Widowed	22	56.83±8.22		
Methods of payment (n)			3.056	0.003
Out of pocket costs	33	53.23±8.33		
Medicare or commercial insurance	109	58.71±9.22		
Monthly incomes (yuan)			2.329	0.021
≥5000	87	58.33±8.47		
<5000	55	55.10±7.33		
SAS (point)			4.097	<0.001
<50	53	60.22±8.92		
≥50	89	54.22±8.16		
SDS (point)			3.094	0.002
<50	57	59.23±7.88		
≥50	85	54.62±9.21		

Note: χ^2 , data from chi-square statistic; t, data from t-test; F, data from rank sum test. Comparison with patients were 18-40 years, ^{aa}P<0.01, ^{aaa}P<0.001; comparison with patients were 41-60 years, ^bP<0.05; comparison with education level of primary education and below, ^cP<0.05, ^{ccc}P<0.001; comparison with education level of lower and upper secondary, ^{dd}P<0.01. CD-RISC: Connor-Davidson resilience scale; SDS: self-rating depression scale; SAS: self-rating anxiety scale.

in psychological endurance about facing symptoms of heart failure compared to younger

patients, resulting in a decrease in psychological resilience. Men showed better levels of

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Table 4. Independent variables and variable assignment table for factors associated with psychological resilience in patients with CHF

Factor	Independent variable	Assignment
Age (years)	X1	≤60=1, >60=0
Gender (n)	X2	Female =1, Male =0
Education level (n)	X3	Senior high school or below =1, college or above =0
Methods of payment (n)	X4	Out of pocket costs =1, Medicare or commercial insurance =0
Monthly incomes (yuan)	X5	<5000=1, ≥5000=0
SAS (point)	X6	≥50=1, <50=0
SDS (point)	X7	≥50=1, <50=0

Note: CHF: chronic heart failure; SDS: self-rating depression scale; SAS: self-rating anxiety scale.

Table 5. Multivariate logistic regression analysis of psychological resilience in patients with CHF

Factor	β	SE	Wald	OR (95% CI)	P
Age	1.723	0.803	6.451	3.452 (0.862-4.872)	0.015
Gender	1.182	0.752	2.821	3.389 (0.872-5.023)	0.035
Education level	0.863	0.881	1.065	2.172 (0.543-10.123)	0.276
Methods of payment	1.235	0.752	2.702	3.021 (0.832-12.125)	0.102
Monthly incomes (yuan)	0.185	0.743	0.089	0.821 (0.192-3.922)	0.762
SAS (point)	1.734	0.702	5.913	5.433 (1.543-14.333)	0.027
SDS (point)	1.812	0.789	6.123	5.654 (1.572-15.823)	0.021

Note: CHF: chronic heart failure; SDS: self-rating depression scale; SAS: self-rating anxiety scale; SE: standard error; OR: odd ratio; CI: confidence interval.

psychological resilience than women in the face of CHF. Female patients may be more sensitive despite receiving more social support, while men have stronger self-esteem and personal endurance [23]. A Chinese study has also manifested that the level of psychological resilience in men with heart failure is higher than that of women [24]. SAS and SDS are scales of anxiety and depression, which were reported to reflect the dynamic changes in an individual's mental resilience under stress [25]. The pathogenesis of heart failure is similar to that of anxiety and depression, which is related to the secretion of pro-inflammatory factors and the hypothalamic-endocrine axis, so patients with heart failure are prone to mental illness, which affects their psychological toughness [13].

Clinical surveys found that the incidences of anxiety and depression in cardiovascular patients were 70.9% and 22.8%, respectively, while the cardiologists' recognition rates of anxiety and depression were only 2.4% and 3.7% [26]. In view of the close connection between cardiovascular disease and mental

health, Hu put forward the concept of psycho-cardiology medicine, advocating that cardiologists should pay attention to not only the patients' physical health, but also their mental health, so that patients can make comprehensive recovery of the heart and psychological status [27]. During psycho-cardiology intervention, professionals from different disciplines

such as cardiology, psychiatry, and basic medicine, work together to improve the clinical therapeutic efficacy for patients [28]. There are various treatment methods for psycho-cardiology, mainly on the basis of standardizing the conventional treatment of cardiovascular disease, supplemented by one or more of psychotropic drugs, traditional Chinese medicine treatment, cognitive behavioral therapy, exercise therapy, music therapy, or relaxation training. The psycho-cardiology management model is aimed at patients with heart failure through psychological and exercise interventions. The level of psychological resilience of patients with heart failure was elevated with prolonged intervention time after psychotherapy combined with cognitive intervention [29]. After cognitive behavioral therapy, the level of psychological resilience of moderately depressed patients with heart failure was increased and the SDS scores were decreased [30]. Exercise therapy, tai chi, and meditation are effective in improving patients' psychological resilience [31, 32]. In this study, we found that psycho-cardiology intervention can improve anxiety and depression in patients with

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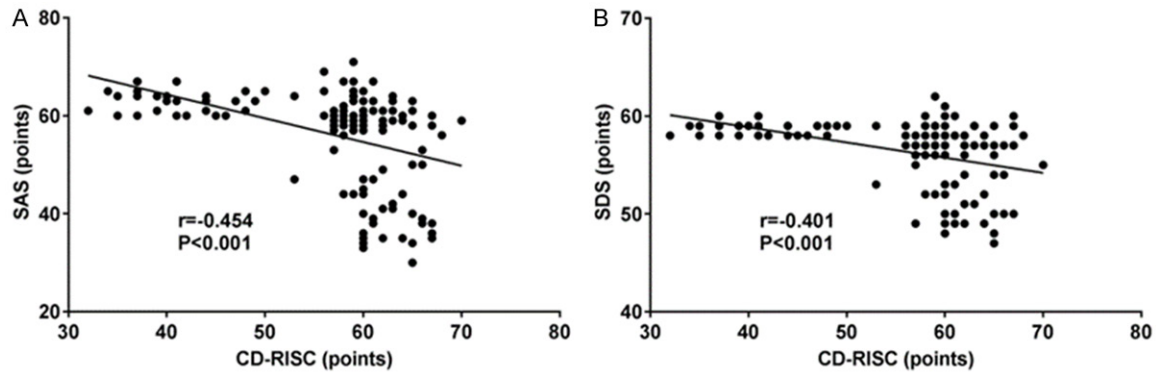


Figure 1. Relationship between resilience and levels of anxiety and depression. A: Relationship between resilience and levels of anxiety; B: Relationship between resilience and levels of depression. SDS: self-rating depression scale; SAS: self-rating anxiety scale; CD-RISC: Connor-Davidson resilience scale.

CHF and improve their psychological resilience, which was consistent with the above findings.

However, there were some limitations in this study. Due to the small sample size, multi-center and multi-sample studies should be carried out in the future, to further explore the factors associated with psychological resilience, and the therapeutic significance and value of psycho-cardiology intervention.

In conclusion, age, gender, SAS, and SDS scores are factors associated with psychological resilience in patients with CHF. Psychological resilience was inversely associated with both anxiety and depression. Psycho-cardiology intervention can improve patients' psychological resilience, and reduce their anxiety and depression.

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Disclosure of conflict of interest

None.

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