

HOSTED BY



Contents lists available at ScienceDirect

International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Research Paper

Family care and subjective well-being of coronary heart disease patients after percutaneous coronary intervention: Mediating effects of coping strategies

Li-Xia Liang^a, Yu Liu^a, Ya-Jie Shi^a, Tong-Tong Jiang^b, Hong-Ru Zhang^a, Bing-Han Liu^a, Peng-Zhu Xu^a, Tie-Ying Shi^{a,*}^a Department of Nursing, The First Affiliated Hospital of Dalian Medical University, Dalian, China^b Nursing Department, Chiba University, Chiba, Japan

ARTICLE INFO

Article history:

Received 11 June 2021

Received in revised form

20 August 2021

Accepted 15 September 2021

Available online 18 September 2021

Keywords:

Coping strategies

Coronary disease

Family care

Percutaneous coronary intervention

Subjective well-being

ABSTRACT

Objectives: To analyze the correlations between family care, coping strategies and the subject well-being (SWB) of patients with coronary heart disease (CHD) after percutaneous coronary intervention (PCI).

Methods: From November 2019 to October 2020, 264 CHD patients who had undergone PCI were enrolled in this questionnaire survey. The research tools applied included General Information Questionnaire, the Adaptation, Partnership, Growth, Affection and Resolve, Medical Coping Modes Questionnaire, and the General Well-being Schedule. SPSS 24.0 and Amos 23.0 software packages were used for statistical analysis.

Results: The mean scores for family care, confrontation, avoidance, acceptance-resignation and SWB, were 7.59 ± 2.24 , 20.03 ± 3.78 , 16.49 ± 2.70 , 10.42 ± 2.01 , and 73.31 ± 11.63 , respectively. Subgroup analysis showed that the path coefficient between family care and subjective well-being was higher in males than females. Family care was directly related to coping strategies. The coping strategies were directly related to SWB, while family care showed an indirect association with SWB via coping strategies.

Conclusions: Family care can improve CHD patients' SWB post-PCI, and coping strategies are important for the link between family care and SWB. Also, men received more family care than women. Based on a patient's characteristics, healthcare providers can promote patients' positive coping strategies, increase their perceived family care, and improve the patient's SWB.

© 2022 The authors. Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is known?

- Previous studies have found that family care often affect the subjective well-being of patients. Previous studies have demonstrated that coping strategies directly or indirectly influence patients' subject well-being.

What is new?

- This study explored the correlations between family care, coping strategies and subjective well-being in patients with coronary heart disease after percutaneous coronary intervention.
- We found that male coronary heart disease patients after percutaneous coronary intervention received more family care than females in this study.

1. Introduction

1.1. Background and literature review

Cardiovascular disease is the main cause of death worldwide, and coronary heart disease (CHD) is a major clinical challenge due

* Corresponding author.

E-mail addresses: 512527095@qq.com (L.-X. Liang), 1227608241@qq.com (Y. Liu), 2504199938@qq.com (Y.-J. Shi), 2415326237@qq.com (T.-T. Jiang), 814517911@qq.com (H.-R. Zhang), 1106157799@qq.com (B.-H. Liu), xpz0828@126.com (P.-Z. Xu), sty11177@163.com (T.-Y. Shi).

Peer review under responsibility of Chinese Nursing Association.

to its high incidence and mortality rate [1,2]. Percutaneous coronary intervention (PCI) has become an important treatment method for CHD due to its advantages of lower pain and remarkable effectiveness compared with drug therapy. However, the reported incidence of restenosis of the stent after PCI has ranged from 16.0% to 44.0%, creating a serious limitation of PCI [3]. In addition to the threat to their survival, many CHD patients also suffer from obvious anxiety and depression post-PCI, which seriously affects their level of subjective well-being (SWB) [4]. Unfortunately, the SWB of CHD patients after PCI has not been investigated fully.

According to the relationship model between positive psychological well-being and cardiovascular health proposed by Kubzansky et al. [5], positive psychological well-being has a direct or an indirect relationship with cardiovascular health through health behaviors, biological functions, and psychological sociology factors, and exerts an important influence on cardiovascular health. As a key parameter in positive psychology research [6], SWB plays an important role in supporting the long-term health of CHD patients after PCI [5]. Importantly, SWB is not only determined by individual patients but also influenced by the individual behaviors of family members from the perspective of social ecology [7]. The degree of care, intimacy, cooperation, and emotional expression of family members for patients will affect patients' physical and mental health [8]. Family care can encourage patients to avoid negative coping styles and adopt positive coping styles during stressful events. However, few studies on SWB among CHD patients have been conducted from the perspective of patients' families. Coping strategies have been considered an important variable in the mediation of SWB in other studies [9]. Few studies have reported correlations between family care, coping strategies, and the SWB of patients with CHD after PCI. Based on the above statements, we focused on positive psychology in the present study and further analyzed the correlation between family care and the coping strategies of patients with CHD after PCI by understanding the status of their SWB in order to provide a strong theoretical basis for clinical strategies to improve the SWB of patients with CHD after PCI.

The Family Care/Caring Theory (FCCT) was proposed by Hohashi and Honda [10] in 2015. The theory's central idea is an established family care process, which is used to describe the cooperative relationship, with specific attention given to the interaction between hospital staff and family caregivers. An annular interactive system is closely formed with mutual "care" between hospital staff and family supporters in family nursing and family care, ultimately promoting the improvement of patients' well-being.

Regarding the correlation between family care and coping strategies, previous studies have included elderly stroke patients as research subjects and found that family care was negatively correlated with avoidance and submission coping strategies [11]. Therefore, they suggested that researchers could reduce patients' use of submission coping strategies by increasing family care. In elderly diabetic nephropathy patients on hemodialysis, Tang et al. [8] showed that family care is the main factor for reducing patients' negative coping strategies and improving patients' positive coping strategies. A survey of 102 breast cancer patients undergoing chemotherapy showed that with a higher level of family care, patients have a higher level of positive coping strategies and are more willing to face disease with their family in a positive way [12]. However, we currently know little about the relationship between family care and medical coping modes, particularly in CHD patients post-PCI.

In a study on the correlation between family care and SWB, Jing et al. [13] showed that patients' family care was positively correlated with SWB. Some studies proposed that family care, patients' health status, cognitive function, and psychosocial-related quality of life are the main factors influencing patients' happiness [14,15].

Another study also considered that emotional connection between family members and patients could help relieve anxiety, depression, and other negative emotions among patients [16].

With respect to coping strategies and SWB, numerous studies have demonstrated that coping strategies directly or indirectly influence patients' SWB [8,17,18]. Svensson et al. [17] showed that patients experience improved individual SWB after adopting rational behavior, seeking help, and receiving appropriate treatment, and positive coping strategies are of great significance in improving patients' SWB. With a greater SWB, patients are more included to adopt positive coping strategies [19]. In a survey of 465 college students [20], coping strategies partially mediated the occurrence of life events and subjective well-being.

1.2. Research purpose

Although previous studies have explored the pairwise relationships among coping strategies, family care, and SWB, little is known about the combined effects of these factors or the underlying mechanisms. Therefore, the present study aimed to 1) investigate the relationships among the three factors, coping strategies, family care, and SWB in patients with CHD after PCI, and 2) explore whether coping strategies have a mediating relationship between family care and SWB.

2. Methods

2.1. Design and sample

Participants were recruited from the CHD Department of the First Affiliated Hospital of Dalian Medical University in Liaoning Province, China, and all participants signed an informed consent form before enrollment. The sample size needed for the study was calculated using the rough estimation method with ten times the number of variables [21]. Twenty-two variables were included in the study; therefore, the required sample size was 220 (22×10). Considering a sample loss of 20.0%, the minimum sample size required for our study was 264 participants. The inclusion criteria were as follows: 1) diagnosis of CHD treated by PCI, 2) aged more than 18 years, 3) clearly understand the disease condition, and 4) provision of written informed consent. The exclusion criteria were 1) previous or current malignancies and 2) a history of cognitive impairment or psychiatric disease.

2.2. Ethical considerations

The present study conformed to the ethical guidelines of the Declaration of Helsinki and was approved by the Research Ethics Committee of the First Affiliated Hospital of Dalian Medical University (approval No. PJ-KS-KY-2019-145). This project was registered in the Chinese Clinical Trial Registry (registration No. ChiCTR2000028855). The participants gave written consent after being informed about the study objectives, their full right to discontinue the study at any time without penalty, and the protection of the confidentiality of their personal information.

2.3. Data collection

Totally 264 inpatients, at least four days after surgery, were surveyed using a questionnaire from November 2019 to October 2020. During the research process, all relevant questionnaire data were collected by the same researcher. After participants completed each questionnaire, the questionnaire was checked immediately to ensure the accuracy and authenticity of the relevant data.

2.4. Instruments

2.4.1. General information questionnaire

A general information questionnaire was used to collect demographic and clinical data, including patients' gender, age, working status, education level, place of residence, per capita monthly income of the family, age at the first onset of CHD, history of other chronic diseases, and so on.

2.4.2. Family Adaptation, Partnership, Growth, Affection, and Resolve (APGAR) scale

The family APGAR scale was designed by Dr. Smikestein [22] and was used to investigate patients' subjective cognition of their family care, in order to evaluate patients' satisfaction with family functions. The present study used the Chinese version of the scale introduced by Lyu and Gu in 1995 [23]. The scale includes five dimensions: adaptation, partnership, growth, affection and resolve. Each question is scored as 2 for "often", 1 for "sometimes", or 0 for "rare", and the sum of all entries is the total score. Total scores of 7–10 reflect good family functioning; scores from 4 to 6 indicate moderate family dysfunction; and scores from 0 to 3 correspond to severe family dysfunction. The reliability and validity of the scale were determined to be 0.80–0.83 and 0.80, respectively.

2.4.3. Medical Coping Modes Questionnaire (MCMQ)

The MCMQ was developed by Feifel et al. [24] and measures basic coping strategies adopted by people facing dangerous situations. The Chinese version of the questionnaire, which was translated by Shen et al. [25], was adopted in this study. This version has 20 items and three dimensions, including confrontation, avoidance, and acceptance-resignation. The Likert 4-level scoring method was adopted. Among the 20 items, items 1, 4, 9, 10, 12, 13, 18, and 19 were scored in the reverse direction, while the other items were scored in the forward direction. Higher scores indicated that a greater percentage of participants tended to adopt a certain strategy. The scale has good reliability, and the Cronbach's α coefficients for the three dimensions of confrontation, avoidance, and acceptance-resignation are 0.69, 0.60, and 0.76, respectively.

2.4.4. General Well-Being (GWB) schedule

The GWB schedule was developed by scholar Anthony Fazio in a National Center for Health Statistics [26] and translated into Chinese by Duan [27]. This schedule is used to measure the general well-being of individuals in the previous month. The GWB schedule contains 18 items and six dimensions, namely satisfying interesting life, freedom from health concern (worry, distress), energy level, cheerful versus depressed mood, emotional-behavioral control, and relaxed versus tense (anxious) feeling. The total score represents the level of SWB with a higher total score indicating stronger SWB. The internal consistency coefficients for this scale are 0.91 for men and 0.95 for women, and the retest reliability coefficient is 0.85.

2.5. Data analysis

Continuous data are expressed as mean (SD). Our analyses were performed using the SPSS 24.0 software package (SPSS Institute Inc., Chicago, IL, USA). The mediating effects of coping strategies on family care and SWB were assessed using Wen's test method [28]. Using this method, in the first step of the regression analysis, the dependent variable was SWB (Y) and the independent variable was family care (X). In the second step, the dependent variables were confrontation (M_1), acceptance-resignation (M_2), and avoidance (M_3), and the independent variable was family care (X). In the third step, the dependent variable was SWB (Y), and the independent variables were family care (X) and $M_1/M_2/M_3$. Path analysis with

structural equation modeling was used to test links between family care, coping strategies and SWB, and these analyses were performed using SPSS Amos 23.0 (IBM Corp., Armonk, NY, USA). The following indexes were used to judge the fit of the model: χ^2 , *df*, root mean square error of approximation (RMSEA), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the incremental fit index (IFI), the tucker–lewis index (TLI), and the comparative fit index (CFI). The threshold values for these indexes were $\chi^2/df < 3$, RMSEA < 0.05 , and GFI, AGFI, IFI, TLI, and CFI > 0.90 . All statistical assessments were set two-sided with a significance level of 0.05.

3. Results

3.1. Characteristics of the study population and correlations with SWB

Among the 242 patients included in this study, the majority (70.7%) were male and the mean age was 62.42 (SD = 10.35) years. Most patients (96.7%) were married, and most (78.9%) had an education level of senior high school or below. The demographic characteristics of the included patients and the correlation coefficients for the relationships between the characteristics and patients' SWB are presented in Table 1.

3.2. Questionnaire scores for CHD patients after PCI and correlations with patients' SWB

The mean SWB score of CHD patients after PCI was 73.31 (SD = 11.63). Table 2 presents the scores for family care and coping strategies of CHD patients after PCI and the correlation coefficients with patients' SWB. Almost all other variables showed a

Table 1
General information of patients with CHD treated with PCI and their SWB scores (n = 242).

| Characteristic | n (%) | Score of SWB (Mean ± SD) | t/F | P |
|--------------------------------|------------|-----------------------------|------|--------|
| Gender | | | 4.10 | <0.001 |
| Male | 171 (70.7) | 75.23 ± 11.15 | | |
| Female | 71 (29.3) | 68.70 ± 11.53 | | |
| Age (year) | | | 0.27 | 0.744 |
| ≤45 | 15 (6.2) | 74.60 ± 10.95 | | |
| 46–65 | 133 (55.0) | 73.64 ± 11.62 | | |
| ≥66 | 94 (38.8) | 72.64 ± 11.82 | | |
| Marital status | | | 1.31 | 0.099 |
| Single | 2 (0.8) | 85.00 ± 8.48 | | |
| Married | 234 (96.7) | 73.28 ± 11.64 | | |
| Divorced | 1 (0.4) | 66.00 ± 0.00 | | |
| Widowed | 5 (2.1) | 71.80 ± 12.29 | | |
| Education | | | 0.69 | 0.944 |
| Junior high school or below | 125 (51.6) | 71.81 ± 10.88 | | |
| Senior high school | 66 (27.3) | 73.96 ± 13.19 | | |
| Undergraduate college or above | 51 (21.1) | 76.13 ± 10.83 | | |
| Residence | | | 1.26 | 0.208 |
| City | 190 (78.5) | 72.82 ± 11.63 | | |
| Village | 52 (21.5) | 75.12 ± 11.55 | | |
| Smoker | | | 2.44 | 0.016 |
| Yes | 101 (41.7) | 75.44 ± 11.43 | | |
| No | 141 (58.3) | 71.78 ± 11.57 | | |
| With complications | | | 1.53 | 0.127 |
| Yes | 186 (76.9) | 72.68 ± 11.25 | | |
| No | 56 (23.1) | 75.39 ± 12.67 | | |
| Per capita income (CNY) | | | 3.11 | 0.046 |
| ≤3,000 | 77 (31.8) | 71.24 ± 11.65 | | |
| 3,001–5,000 | 104 (43.0) | 73.17 ± 10.45 | | |
| ≥5,001 | 61 (25.2) | 76.16 ± 13.02 | | |

Note: CHD = coronary heart disease. PCI = percutaneous coronary intervention. SWB = subjective well-being.

Table 2
Average scores of family care and coping strategies and correlations with SWB among CHD patients after PCI (n = 242).

| Item | Mean ± SD | Score range | Correlation with SWB | |
|------------------------|--------------|-------------|----------------------|--------|
| | | | r | P |
| Family care | 7.59 ± 2.24 | 0–10 | 0.20 | 0.002 |
| Adaptation | 1.50 ± 0.62 | 0–2 | 0.15 | 0.020 |
| Partnership | 1.47 ± 0.60 | 0–2 | 0.14 | 0.028 |
| Growth | 1.49 ± 0.65 | 0–2 | 0.14 | 0.032 |
| Affection | 1.58 ± 0.54 | 0–2 | 0.12 | 0.071 |
| Resolve | 1.55 ± 0.60 | 0–2 | 0.18 | 0.005 |
| Coping strategies | | | | |
| Confrontation | 20.03 ± 3.78 | 13–31 | 0.35 | <0.001 |
| Avoidance | 16.49 ± 2.70 | 10–21 | −0.31 | <0.001 |
| Acceptance-resignation | 10.42 ± 2.01 | 5–18 | −0.36 | <0.001 |

Note: CHD = coronary heart disease. PCI = percutaneous coronary intervention. SWB = subjective well-being.

correlation with SWB except the affection dimension. Among coping strategies, avoidance and acceptance-resignation were negatively correlated with SWB; all other variables were positively correlated with SWB.

3.3. Structural equation model

In the first step, R^2 was 0.039 ($c = 0.196, P = 0.002$). In the second step, R_1^2 was 0.038, R_2^2 was 0.046, and R_3^2 was 0.017 ($a = 0.194, -0.214, -0.132, P < 0.05$). In the third step, R_1^2 was 0.142, R_2^2 was 0.147, and R_3^2 was 0.119 ($c' = 0.133, 0.124, 0.159, P < 0.05$), with $c' < c$. The results showed that the three coping strategies played a mediating role in the relationship between family care and SWB (Table 3).

As shown in Table 3, family care had a significant effect on SWB prediction alone. The regression coefficient was still significant when confrontation, acceptance-resignation, or avoidance were used as an intermediary variable. These results suggest that coping strategies play a partial mediating role between family care and SWB.

To further verify the mediating effects among the three factors, the interaction path among the three factors was examined, and the structural equation model diagrams for the three factors and their dimensions were generated using Amos 23.0. The final model showed that all paths were statistically significant and all models had a better fit upon elimination of inconspicuous paths in the hypothesis model. Family care exerted a direct effect on SWB ($P < 0.05$). For model 1 (Fig. 1): $\chi^2 = 48.26, df = 42, \chi^2/df = 1.15, RMSEA = 0.02, GFI = 0.96, AGFI = 0.94, IFI = 0.99, TLI = 0.99, and CFI = 0.99$. This model showed that confrontation mediated the relationship between family care and SWB (95% CI: 0.032, 0.170).

Table 3
Regression analysis of coping strategies moderating the relationship between family care and SWB.

| Step | Dependent variable | Independent variable | B | SE | β | t | P | R^2 | Adjusted R^2 | F | P |
|------|------------------------|------------------------|--------|--------|---------|--------|--------|-------|----------------|--------|--------|
| 1 | SWB | Family care | 1.019 | 0.328 | 0.196 | 3.10 | 0.002 | 0.039 | 0.035 | 9.632 | 0.002 |
| 2 | Confrontation | Family care | 0.327 | 0.107 | 0.194 | 3.06 | 0.002 | 0.038 | 0.034 | 9.367 | 0.002 |
| | | Acceptance-resignation | −0.191 | 0.056 | −0.214 | −3.39 | 0.001 | 0.046 | 0.042 | 11.492 | 0.001 |
| 3 | SWB | Avoidance | −0.159 | 0.077 | −0.132 | −2.07 | 0.040 | 0.017 | 0.013 | 4.269 | 0.040 |
| | | Family care | 0.689 | 0.317 | 0.133 | 2.18 | 0.031 | 0.142 | 0.135 | 10.783 | <0.001 |
| | | Confrontation | 1.008 | 0.188 | 0.328 | 5.37 | <0.001 | | | | |
| SWB | Family care | 0.645 | 0.317 | 0.124 | 2.03 | 0.043 | 0.147 | 0.140 | 20.621 | <0.001 | |
| | Acceptance-resignation | −1.956 | 0.355 | −0.337 | −5.52 | <0.001 | | | | | |
| SWB | Family care | 0.823 | 0.318 | 0.159 | 2.59 | 0.010 | 0.119 | 0.111 | 16.064 | <0.001 | |
| | Avoidance | −1.229 | 0.264 | −0.285 | −4.66 | <0.001 | | | | | |

Note. SWB = subjective well-being.

For model 2 (Fig. 2): $\chi^2 = 58.01, df = 42, \chi^2/df = 1.38, RMSEA = 0.04, GFI = 0.96, AGFI = 0.93, IFI = 0.98, TLI = 0.97, and CFI = 0.98$. This model showed that acceptance-resignation mediated the relationship between family care and SWB (95% CI: 0.008, 0.100). For model 3 (Fig. 3), $\chi^2 = 52.34, df = 42, \chi^2/df = 1.25, RMSEA = 0.03, GFI = 0.96, AGFI = 0.94, IFI = 0.99, TLI = 0.98, and CFI = 0.98$. This model showed that avoidance mediated the relationship between family care and SWB (95% CI: 0.038, 0.165).

In our study, a significant difference in SWB was observed between male and female patients. Therefore, in order to further explore the gender differences among family care, coping strategies and SWB, a mediation model was constructed by gender. Subgroup analysis showed that the path coefficient between family care and SWB was higher in males than in females.

4. Discussion

The purpose of the present study was to investigate the relationships among coping strategies, family care, and SWB in CHD patients treated with PCI. The results of path analysis showed that family care could have an indirect impact on SWB through coping strategies as well as a direct impact on SWB in CHD patients after PCI.

4.1. Status of family care for patients after PCI

The score for family care among the CHD patients after PCI were slightly higher than those for patients with diabetic nephropathy undergoing hemodialysis [29] but lower than those for patients after hysterectomy [30]. CHD patients often seek urgent medical care due to a sudden feeling of bodily discomfort. The included patients and their family members experienced the patient's complete progression from myocardial infarction to improvement, with the patient receiving PCI during this course. This experience can make the patient and their family members more aware of the significance of survival and improve patients scores for subjective evaluation of their level of family care. After treatment with PCI, patients are often accompanied by their spouses and children, and patients are likely to receive more care from family members, meaning the family care level is high.

4.2. Current situation of coping strategies of patients after PCI

In our study, CHD patients after PCI had slightly increased scores compared with the normal population [25] for acceptance-resignation and avoidance, and the differences were statistically significant. The avoidance score post-PCI was 16.49 ± 2.70 , and the normal population score was $14.44 \pm 2.97 (t = 9.47, P < 0.001)$. In this study, the yield score post-PCI was 10.42 ± 2.01 , and the norm score was $8.81 \pm 3.17 (t = 7.40, P < 0.001)$. These findings are

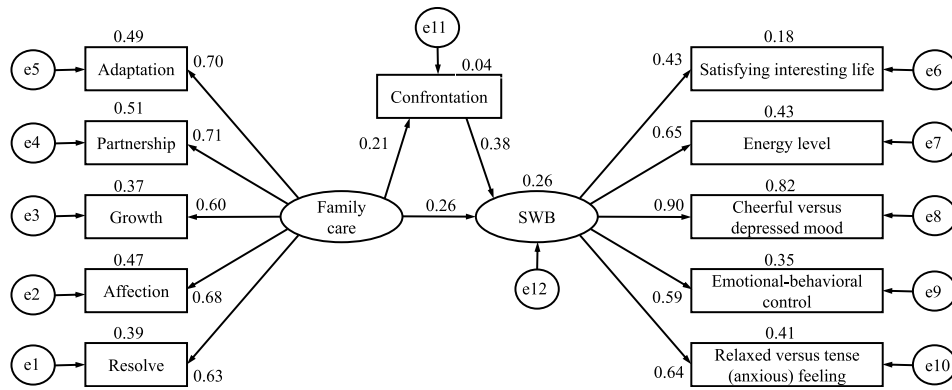


Fig. 1. Model 1: Mediating effects of confrontation. SWB = subjective well-being.

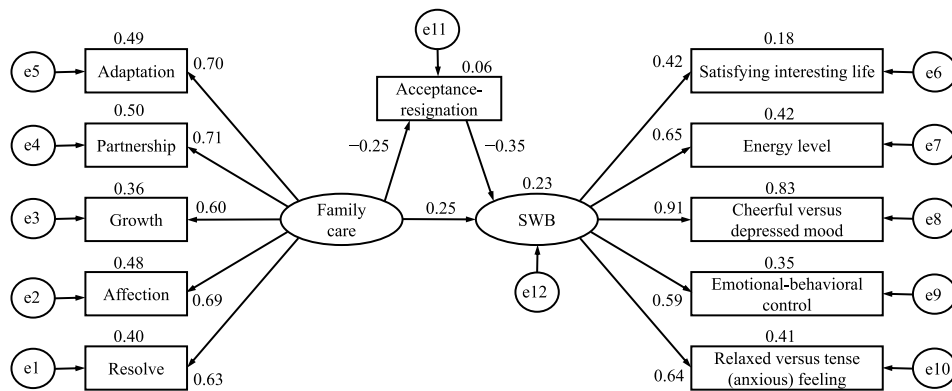


Fig. 2. Model 2: Mediating effects of acceptance-resignation. SWB = subjective well-being.

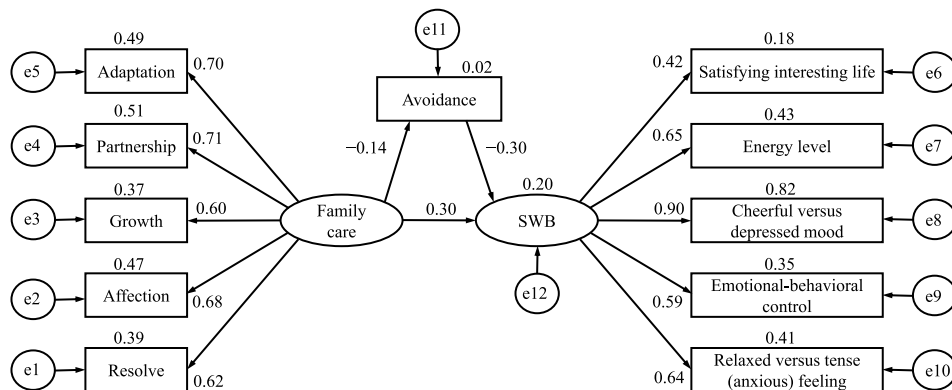


Fig. 3. Model 3: Mediating effects of avoidance. SWB = subjective well-being.

consistent with those of Wu et al. [31]. Additionally, the patients' mean score for confrontation was higher than the norm, again consistent with previous research [32], although this difference was not statistically significant. Patients with CHD experience a long course of disease. With the development of the disease, the patient's knowledge of the disease likely increases through the sharing of medical information by providers, health-related programs, and other ways that disease knowledge is shared. Patients usually realize that although this type of disease cannot be completely cured, by following their doctor's guidance for medication usage and scientific cardiac rehabilitation exercise, the disease can be well controlled. Therefore, patients with CHD will choose more confrontation. However, when they choose to use the confrontation coping strategies, different situations will produce different forms, as observed in a survey of patients with esophageal cancer [33]. In the present study, adopting too much confrontation might cause anxiety because too much confrontation makes patients overly concerned about the side effects of treatment. As a chronic disease, patients with CHD experience increasingly adverse symptoms with increasing age, which may greatly trouble patients. Therefore, in the long course of rehabilitation, proper measures of avoidance strategies might be suitable for these patients.

4.3. Status of SWB of patients after PCI

4.3.1. Analysis of SWB in total status

The mean SWB score for the patients included in this study was lower than that reported among breast cancer patients by Liu et al. [9]. The scale used in this study is used to evaluate the well-being status of patients in the previous month. The lowest score in this survey was 45, indicating that some patients showed low satisfaction and interest in postoperative life, more worries about health, lack of energy, and low mood, and were often in a state of stress. The reason may be that PCI therapy for CHD patients cannot completely cure the disease, and patients still need long-term drug therapy to strengthen and consolidate the therapeutic effect. Long-term medication usage and the uncertainty about the therapeutic effect can make CHD patients depressed. Moreover, the patients continue facing the possibility of the recurrence of angina and other symptoms. A recurrent attack of the disease and the insignificant treatment effect will bring the patients physical and psychological pain and increase patients' worry about their health. When the patients consider their health status to be worse, patients are likely to experience negative emotions such as anxiety, which significantly reduces the SWB level of life satisfaction [8].

4.3.2. Analysis of SWB in different genders

Men receive more family care than women, which may be because men tend to solve problems independently or seek help from family members when they encounter problems. On the contrary, women tend to confide in multiple friends and are more willing to follow others' suggestions. Accordingly, these women seek solutions to their current problems through the support and understanding of others and show little dependence on their families.

4.4. Mediating role of coping strategies in the relationship between family care and SWB

Pathway analysis showed that the level of family care among patients with CHD after PCI affected their type of coping strategies when they were under the state of stress, and to a certain extent, affected their SWB. In Chinese culture, the family is the basis and

starting point for all members during family activities. Because different family members play different roles in the family function, the family is not a simple sum of individuals, but via the organization and subsystem interdependence, they exist at the level of social organization [34]. For patients with high levels of family care, their family members have a clear sense of responsibility, find good ways to solve problems, and can be coordinated to encourage their family member with CHD to face difficult problems together. At the same time, with higher levels of family care, family members are in greater communication with patients, listening to patients' thoughts and securing the relationships among family members. When patients receive more family care, they may adopt acceptance-resignation coping strategies, learn to use all types of social resources around them to adapt to the pressure, and overcome difficulties, to help the patient achieve more psychological growth [35]. With a low level of family care, patients tend to adopt acceptance-resignation or avoidance coping strategies. A lack of confidence will increase patients' physical and mental burden, finally leading to lower happiness.

Based on the results of this study, we propose the following two suggestions. On the one hand, hospital staff, which are multidisciplinary teams of doctors, nurses, and nutritionists, can hold family experience conferences to identify problems and unmet needs among patients' families. To resolve the adverse factors affecting family care, we must meet family members' information needs, promote patients' recovery, stimulate family members' support for patients, improve patients' confidence in the treatment of the disease, and improve patients' SWB [36,37]. On the other hand, the coping strategies of patients should be evaluated. To be provided health education according to the evaluation results, patients with CHD should be guided to perceive the disease, improve their mood, and constantly adjust their mentality, adopting an optimistic attitude in the future. At the same time, the patient's family member is suggested to join the community interaction activities to promote their communication and expression of inner feelings, allowing them to spend more time with patients, understand the patient's thoughts, further improve care for patients, and improve the patients' SWB.

4.5. Limitations

Our study has several limitations. First, this study was a cross-sectional survey, which can only reflect the predictive relationships between family care and SWB of patients with CHD after PCI under the mediating role of coping strategies, and it may not apply to other patients. Furthermore, our study was conducted in a province in China, and thus, the results might not be applicable to populations in other areas. Thirdly, since a self-rating scale was used, the results may be related to the respondents' tendency to provide self-disclosure. Unintentional or intentional beautification of the responses may lead to a slightly higher survey result than the actual level of SWB.

5. Conclusion

CHD patients' family care is correlated to their SWB post-PCI, and coping strategies play important mediating roles between family care and SWB of patients. There was a significant difference in SWB between male and female patients. In the future, multi-center studies should be carried out to improve the generalizability of the research results. Finally, to the extent possible, more objective measurement tools or biochemical assessment indicators should be introduced to assess the SWB of patients to obtain more rigorous research results.

CRediT authorship contribution statement

Li-Xia Liang: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing, Project administration. **Yu Liu:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing. **Ya-Jie Shi:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing. **Tong-Tong Jiang:** Conceptualization, Methodology, Validation, Formal analysis, Resources, Writing - review & editing. **Hong-Ru Zhang:** Conceptualization, Methodology, Validation, Writing - review & editing, Project administration. **Bing-Han Liu:** Conceptualization, Methodology, Data curation, Writing - review & editing. **Peng-Zhu Xu:** Conceptualization, Investigation, Writing - original draft, Supervision. **Tie-Ying Shi:** Conceptualization, Funding acquisition, Writing - review & editing, Supervision, Project administration.

Funding

This study was provided by The Scientific Research Foundation of Liaoning Provincial Education Department, China (grant no. LZ2020039).

Declaration of competing interest

None known.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2021.09.006>.

References

- [1] WHO. Cardiovascular diseases. 2021. p. 21. [https://www.who.int/zh/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/zh/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)),1.
- [2] The writing committee of the report on cardiovascular health diseases in China. *Chin Circ J* 2020;35(9):833–54. <https://doi.org/10.3969/j.issn.1000-3614.2020.09.001>.
- [3] Alraies MC, Darmoch F, Tummala R, Waksman R. Diagnosis and management challenges of in-stent restenosis in coronary arteries. *World J Cardiol* 2017;9(8):640–51. <https://doi.org/10.4330/wjcv.v9.i8.640>.
- [4] Xu QX, Jiang QF, Liu D, Bai XC, Qin ZF, Guan J. Characteristics and psychological intervention of depression and anxiety before and after PCI in patients with coronary heart disease. *Chin J Gerontol* 2019;39(5):1230–2. <https://doi.org/10.3969/j.issn.1005-9202.2019.05.065>.
- [5] Kubzansky LD, Huffman JC, Boehm JK, Hernandez R, Kim ES, Koga HK, et al. Reprint of: positive psychological well-being and cardiovascular disease: jacc health promotion series. *J Am Coll Cardiol* 2018;72(23 pt b):3012–26. <https://doi.org/10.1016/j.jacc.2018.10.023>.
- [6] Gao L, Moodie M, Chen G. Measuring subjective wellbeing in patients with heart disease: relationship and comparison between health-related quality of life instruments. *Qual Life Res* 2019;28(4):1017–28. <https://doi.org/10.1007/s11136-018-2094-y>.
- [7] Nyambe A, Van Hal G, Kampen JK. Screening and vaccination as determined by the social ecological model and the theory of triadic influence: a systematic review. *BMC Publ Health* 2016;16(1):1166. <https://doi.org/10.1186/s12889-016-3802-6>.
- [8] Tang N, Du JL, Lin P. The effect of family care on coping style of elderly diabetic nephropathy patients on hemodialysis. *Chin J Gerontol* 2016;36(2):440–1. <https://doi.org/10.3969/j.issn.1005-9202.2016.02.089> [In Chinese].
- [9] Liu Y, Jiang TT, Shi TY. The relationship among rumination, coping strategies, and subjective well-being in Chinese patients with breast cancer: a cross-sectional study. *Asian Nurs Res* 2020;14(4):206–11. <https://doi.org/10.1016/j.anr.2020.07.005>.
- [10] Hohashi N, Honda J. Concept development and implementation of family care/caring theory in concentric sphere family environment theory. *Open J Nurs* 2015;5(9):749–57. <https://doi.org/10.4236/ojn.2015.59078>.
- [11] Fan ZG, Yuan QM, Men RX. Mediating role of medical coping style in family care and sleep quality in elderly stroke patients. *Chin J Gerontol* 2020;40:1989–92. <https://doi.org/10.3969/j.issn.1005-9202.2020.09.060> [In Chinese].
- [12] Zhang LL. Correlation analysis of family care, psychological pain and coping style in patients with breast cancer radiotherapy. *J Med Theor Pract* 2019;32:605–7. <https://doi.org/10.19381/j.issn.1001-7585.2019.04.073> [In Chinese].
- [13] Jing YY, Wan J, Shen JW, He HY, Dai WQ. Analysis of influencing factors on subjective well-being in patients with stroke. *J Nurs Adm* 2018;18(9):622–6. <https://doi.org/10.3969/j.issn.1671-315x.2018.09.004>.
- [14] Nan HR, Ni MY, Lee PH, Tam WWS, Lam TH, Leung GM, et al. Psychometric evaluation of the Chinese version of the subjective happiness scale: evidence from the Hong Kong FAMILY cohort. *Int J Behav Med* 2014;21(4):646–52. <https://doi.org/10.1007/s12529-014-9389-3>.
- [15] Deng JL, Hu JM, Wu WL, Dong BR, Wu HM. Subjective well-being, social support, and age-related functioning among the very old in China. *Int J Geriatr Psychiatr* 2009;25(7):697–703. <https://doi.org/10.1002/gps.2410>.
- [16] Reed-Knight B, van Tilburg MAL, Levy RL, Langer SL, Romano JM, Murphy TB, et al. Maladaptive coping and depressive symptoms partially explain the association between family stress and pain-related distress in youth with IBD. *J Pediatr Psychol* 2018;43(1):94–103. <https://doi.org/10.1093/jpepsy/jsx082>.
- [17] Svensson T, Inoue M, Sawada N, Charvat H, Iwasaki M, Sasazuki S, et al. Coping strategies and cancer incidence and mortality: the Japan Public Health Center-based prospective study. *Cancer Epidemiol* 2016;40:126–33. <https://doi.org/10.1016/j.canep.2015.12.003>.
- [18] Kroemeke A. Changes in well-being after myocardial infarction: does coping matter? *Qual Life Res* 2016;25(10):2593–601. <https://doi.org/10.1007/s11136-016-1286-6>.
- [19] Qin Q, Meng S, Tang QQ. Mediating effect of coping style between the subjective well-being and self-perception aging of the elderly in the nursing homes. *Chin Nurs Res* 2020;34(24):4394–7. <https://doi.org/10.12102/j.issn.1009-6493.2020.24.015> [In Chinese].
- [20] Liu Z. The influence of negative life events on subjective well-being of college Students (master's thesis). Changchun: Jilin University; 2020 [In Chinese].
- [21] Sun ZQ. Medical statistics. third ed. Beijing: People's Medical Publishing House; 2010. p. 502–3.
- [22] Smilkstein G. The physician and family function assessment. *Fam Syst Med* 1984;2(3):263–78. <https://doi.org/10.1037/h0091661>.
- [23] Lyu F, Gu Y. Family APGAR questionnaire and its clinical application. *Foreign Med Sci Ser Hosp Manag* 1995;(2):56–9 [In Chinese].
- [24] Feifel H, Strack S, Nagy VT. Degree of life-threat and differential use of coping modes. *J Psychosom Res* 1987;31(1):91–9. [https://doi.org/10.1016/0022-3999\(87\)90103-6](https://doi.org/10.1016/0022-3999(87)90103-6).
- [25] Shen XH, Jiang QJ. Report on application of Chinese version of MCMQ in 701 patients. *Chin J Behav Med Sci* 2000;9(1):22–4. <https://doi.org/10.3760/cma.j.issn.1674-6554.2000.01.008>.
- [26] Fazio AF. A concurrent validation study of the NCHS General Well-Being Schedule. *Vital Health Stat 2 Data Eval Methods Res* 1977;(73):1–53.
- [27] Duan JH. The results and analysis of the general well-being scale in Chinese college students. *Chin J Clin Psychol* 1996;4(1):56–7 [In Chinese].
- [28] Wen ZL, Ye BJ. Analyses of mediating effects: the development of methods and models. *Adv Psychol Sci* 2014;22(5):731. <https://doi.org/10.3724/sp.j.1042.2014.00731>.
- [29] Fu QG, Shang HQ, Li LK, Su XL, Song YC, Liu Y, et al. Family care degree and influencing factors of elderly diabetic nephropathy patients with hemodialysis. *Chin J Gerontol* 2017;37(24):6204–6. <https://doi.org/10.3969/j.issn.1005-9202.2017.24.087> [In Chinese].
- [30] Dai R. Investigation on the status quo of life and family care in patients with hysterectomy (master's thesis). Shihezi: Shihezi University; 2018 [In Chinese].
- [31] Wu XQ, Ou YL. Correlation between risk perception and medical coping styles in patients with coronary heart disease. *Chin Nurs Res* 2017;31(33):4305–7. <https://doi.org/10.3969/j.issn.1009-6493.2017.33.040> [In Chinese].
- [32] Chen L. Research on correlation study between self-perceived burden, medical coping modes and self-management in patients undergone coronary artery stent implantation (master's thesis). Dalian: Dalian Medical University; 2019 [In Chinese].
- [33] Wu XD, Qin HY, Zhang JE, Zheng MC, Xin MZ, Liu L, et al. The prevalence and correlates of symptom distress and quality of life in Chinese oesophageal cancer patients undergoing chemotherapy after radical oesophagectomy. *Eur J Oncol Nurs* 2015;19(5):502–8. <https://doi.org/10.1016/j.ejon.2015.02.010>.
- [34] Wei RQ, Zhang YH, Yang WB. Influence of structural family therapy on depression in community chronic obstructive pulmonary disease patients. *Chin Nurs Res* 2014;28(10):3519–21. <https://doi.org/10.3969/j.issn.1009-6493.2014.28.025> [In Chinese].
- [35] Zhang HR, Ju M, Yi ZH, Li Q, Xu TF. The current status and influence factors of family function of community elderly. *Mod Prev Med* 2020;47(23):4290–4 [In Chinese].
- [36] Dieperink KB, Coyne E, Creedy DK, Østergaard B. Family functioning and perceived support from nurses during cancer treatment among Danish and Australian patients and their families. *J Clin Nurs* 2018;27(1–2):e154–61. <https://doi.org/10.1111/jocn.13894>.
- [37] Solomon I, Rybak C, Van Tongeren L, Kuzmich L, Blazer K, Nehoray B, et al. Experience gained from the development and execution of a multidisciplinary multi-syndrome hereditary colon cancer family conference. *J Canc Educ* 2019;34(6):1204–12. <https://doi.org/10.1007/s13187-018-1430-9>.