

The Mediating Effect of Psychological Resilience and Coping Style on Fear of Recurrence and Reproductive Concerns in Breast Cancer Patients of Childbearing Age

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Objective: Fear of recurrence and reproductive concerns are great public health concerns among breast cancer patients in childbearing age. The purpose of this study was to explore whether psychological resilience and coping styles play mediating roles in fear of recurrence and reproductive concerns among Chinese breast cancer patients in childbearing age.

Methods: A total of 1267 breast cancer patients of childbearing age completed the questionnaires, including a brief demographic questionnaire survey. The Chinese version of the Fear of Cancer Recurrence Scale and the Chinese version of the Reproductive Concerns Scale were used to assess the fear of recurrence and reproductive concerns, respectively. And the psychological resilience scale and the simple coping style questionnaire were used to evaluate breast cancer patients' psychological resilience and coping style during childbearing age. Mediation analyses were conducted by using PROCESS macro in the SPSS software.

Results: Fear of recurrence had both direct and indirect effects on Reproductive Concerns. psychological resilience and coping style were not only independent mediators in the relationship between fear of recurrence and Reproductive Concerns but also chain mediators.

Conclusion: The results of the current study highlight the crucial role of early intervention for Reproductive Concerns with a focus on fear of recurrence of breast cancer patients of childbearing age, more especially, on those with poorer psychological resilience and coping style.

Keywords: childbearing age, breast cancer, fear of recurrence, reproductive concerns, psychological resilience, coping style

Introduction

In 2021, China has entered a deeply aging society. To increase the birth rate, the state has successively introduced a series of policies to encourage the birth of a second child, and women's reproductive demand has gradually increased.¹ At the same time, the onset age of female cancer patients also showed a significant trend of advance.² A study in the United States showed that the incidence of cancer in adolescents and young adults increased by nearly 30% between 1973 and 2015.³ The survival rate of cancer patients has generally improved due to the advances in diagnosis and treatment technology. As a result, more and more research is focusing on fertility in female cancer patients.

Breast cancer is one of the most common malignant cancers in women, and the incidence rate of breast cancer in Chinese women is increasing at twice the global rate.⁴ According to the latest national cancer statistics released by the National Cancer Center in 2024,⁵ breast cancer has the second highest incidence of all female cancers. With the continuous improvement of early screening technology and comprehensive treatment of breast cancer, its long-term survival rate has been significantly improved.⁶ About 26% of young female patients still have fertility intention when

diagnosed with breast cancer.⁷ Anti-cancer treatment inevitably leads to the destruction or loss of fertility,⁸ and some patients have reproductive concerns.

Reproductive concerns refer to an individual's excessive concern about reproduction and offspring care, including their health, fertility, children's health, partner relationships, and child care.⁹ Because cancer itself and its related treatment will cause severe damage to female fertility, there is a contradiction between disease treatment, survival, health needs, and fertility needs of breast cancer patients, which inevitably leads to solid fertility concerns. In addition, women of childbearing age are in the golden age of life and shoulder more family responsibilities such as pregnancy and childbearing. Hence, the desire to have children is also more robust. Patients often have a higher level of reproductive concerns, and a high level of reproductive concerns may be more likely to aggravate the mental pressure and psychological conflict of patients than cancer itself. Then, it affects the later treatment decision, disease prognosis, and psychosomatic state.

Compared with cancer treatment, the reproductive concerns of female cancer patients of childbearing age have not received enough attention to some extent.¹⁰ However, a high level of reproductive concerns is more likely to increase the mental stress and psychological conflict of patients, which will affect the follow-up treatment decision, disease prognosis, and psychosomatic state. Fear of recurrence is the fear or apprehension associated with the recurrence or progression of cancer. Studies have shown¹¹ that uncertainty and fear of recurrence of the disease aggravate fertility concerns of breast cancer patients. Psychological resilience refers to an individual's ability to adapt to the environment and effectively deal with problems under trauma, adversity, threat, and pressure.¹² From the perspective of positive psychology, psychological resilience can prevent mental illness and promote and accelerate healing. It benefits individuals who face adversity in a good psychological state and can positively predict reproductive concerns. Coping styles refer to the strategies individuals use to manage the psychological stress associated with challenging situations.¹³ Studies have shown that positive coping can alleviate the psychological distress of cancer patients,¹⁴ while negative coping can lead to increased anxiety in cancer patients.¹⁵ While psychological resilience is a broader concept that encompasses an individual's overall capacity to withstand and bounce back from stress, coping styles are the specific methods used in the process. They can overlap in that psychological resilience can be seen as a foundation that influences individual selection and implementation of coping strategies. However, there are relatively few studies on the mediating effect of psychological resilience and coping styles between fear of recurrence and reproductive concerns, and whether there is a chain mediating effect is unknown.

Lazarus¹⁶ is an outstanding American psychologist who proposed the stress and coping model in the 1960s. Stress and coping theory holds that individuals adapt to stress by adopting a series of psychological and behavioral responses. In this study, the fear of recurrence was regarded as the stressor of breast cancer patients, and the reproductive concerns were regarded as the coping result. For breast cancer patients, reproductive concerns might involve evaluating the threat to fertility or the impact on family planning. Lazarus' model could address these by examining how patients cognitively appraise these concerns and select coping strategies, which include engaging in emotional regulation techniques.

Based on previous studies and stress coping theory, the conceptual framework (shown in Figure 1) and the following hypotheses are proposed: 1) there is a significant association between psychological resilience, coping styles, fear of recurrence, and reproductive concerns; 2) Psychological resilience and coping style play a mediating role between fear of recurrence and reproductive concerns; 3) Psychological resilience and coping style play a chain mediating role between fear of recurrence and reproductive concerns.

Methods

Data

This study uses an electronic questionnaire as a survey tool. First of all, we contacted the person in charge of each department or head nurse in the hospital, and after obtaining consent, explained the purpose and significance of the study to the patients and instructed them how to fill in the questionnaire correctly. Questionnaires are submitted anonymously through the Questionnaire Star platform. The ethical principles of the Declaration of Helsinki conduct this study. The Ethics Committee of Bengbu Medical University is responsible for moral approval and consent to participate. Before the

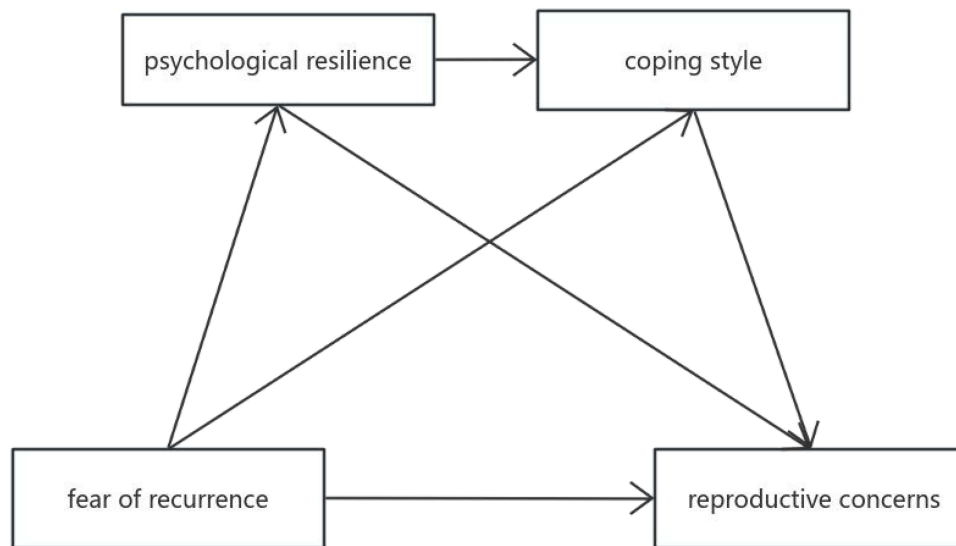


Figure 1 The conceptual framework. The figure based on previous studies and stress coping theory.

formal investigation, 80 patients were selected for a pre-survey, and the content and method of the questionnaire were adjusted according to their feedback. A total of 1267 questionnaires were sent out. After the survey, we carefully reviewed the quality of the questionnaires, excluded invalid questionnaires, and finally recovered 1200 questionnaires, with a recovery rate of 94.71%.

Participants

Female breast cancer patients of childbearing age who were hospitalized in three hospitals in Anhui Province from July 2023 to March 2024 were selected as the study objects. Inclusion criteria: (1) Patients diagnosed with primary breast cancer by biopsy; (2) Age 18–49 years old; (3) The patient is aware of the cancer diagnosis and signs the informed consent. Exclusion criteria: (1) Patients with other serious complications or severe mental disorders; (2) People with language expression and communication disabilities; (3) Patients who did not know the cancer diagnosis or were unwilling to cooperate. Exclusion criteria: (1) The missing value of the items in the questionnaire was >5%; (2) found that the answer is the rule.

Material

General Situation Table

Design and form based on consultation with experts, Include the patient's general information (including age, spouse, education level, etc.); Patient disease data (including cancer stage, course of disease, treatment, etc).

Chinese Recurrence Anxiety Scale

The Chinese version of the Cancer Recurrence Anxiety Scale (CARS) was adopted.¹⁷ The scale contains 29 questions covering five dimensions and is rated using a five-point Likert scale. Participants self-assessed, with a score of 0 representing “not at all” and a score of 4 representing “very much”. The overall score ranges from 4 to 124, with higher scores indicating more significant concern about recurrence. The Cronbach's alpha of this scale in this study was 0.988, which showed good reliability and effectiveness.

Mental Resilience Scale

The scale was initially developed by Connor et al¹⁸ in 2003. The Chinese version was localized by Yu et al,¹⁹ showing good reliability and validity. The scale includes three dimensions: resilience, optimism, and self-reliance. Using the Likert 5-point scale, 0 means “never”, and four means “always”. The higher the score, the stronger the individual's psychological resilience. The coefficient of the original scale was 0.858, while the Cronbach's alpha of the scale in this study was 0.984.

Simple Coping Style Questionnaire

This questionnaire was initially developed by Folkman et al²⁰ and modified and optimized by Xie Ya ning¹³ for local culture. The questionnaire covers positive and negative coping dimensions, contains 20 items, and uses a Likert four-level rating system ranging from “do not take” to “often take” on a scale of 0 to 3. Of the two dimensions, only the positive coping dimension was used in this study to assess patients’ coping behaviors, which consisted of 12 entries with a total score of 0 to 36. The higher the score, the more inclined the patient was to adopt positive coping strategies. The Cronbach’s alpha of this positive coping dimension in this study was 0.964.

Post-Cancer Fertility Worry Scale

The scale was developed in 2013 by Professor Gorman²¹ et al in the United States to assess the degree of concern of young female cancer patients about fertility problems. Qiao Tingting²² and her team sinicized and revised the scale in 2017. The scale consists of six different dimensions. Likert 5-level scoring was adopted, ranging from 1 (strongly disagree) to 5 (strongly agree). The higher the score, the more serious the patient’s fertility concerns were. The Cronbach’s alpha of the scale in this study reached 0.803.

Statistical Analysis

SPSS 25.0 statistical analysis software was used to process the data, and the measurement data represented the scores of each variable using mean and standard deviation. In contrast, the counting data was represented by frequency and percentage. Univariate analysis of fertility concerns for breast cancer in childbearing age was performed using two independent samples of *t*-test or ANOVA. The correlation between fertility anxiety and fear of recurrence, psychological resilience, and coping style after Pearson analyzed cancer surgery. After controlling for variables with statistically significant differences in the univariate analysis, Model 6 in the Process was used to examine the mediating role of psychological resilience and coping styles between fear of recurrence and reproductive concerns. After 5000 times of the mediation effect analysis of Bootstrap samples, it was found that the mediation effect is noticeable when no 0 is included in the 95% confidence interval.

Results

Testing for Common Method Bias

Restricted by objective conditions, the data of the variables in this study were self-reported by the participants, so common method bias could exist. According to the suggestions corresponding controls were carried out in terms of procedures, such as protecting the anonymity of the participants and reducing the guess about the purpose of the measurement.²³ Data were tested for common method bias by using Harman’s univariate test. The results showed that the roots of the six factor features were greater than 1 and the first factor variance interpretation rate was 20.147%, below the 40% critical criterion, indicating that this study is within the acceptable range in terms of common methodological biases.

Descriptive Analysis Results

The basic information of breast cancer patients of childbearing age was included: 432 (36%) aged 18–28, 288 (24%) aged 29–38, and 480 (40%) aged 39–49. Education level: junior high school or below 306 (25.5%), senior high school or technical secondary school 367 (30.6%), junior college or above 527 (43.9%); Children: 528 without children (44%), 672 with children (56%) The comparison of reproductive concerns scores of breast cancer patients with different characteristics at childbearing age is shown in Table 1.

Correlation Analysis

According to Spearman correlation analysis, there was a positive correlation between reproductive concerns and fear of recurrence in breast cancer at childbearing age and a negative correlation between reproductive concerns and psychological resilience and coping style scores, as shown in Table 2.

Table 1 Comparison of Reproductive Concerns Scores of Patients with Different Characteristics

Variable	Item	Number	M (SD)	F/t	p
Spouse	No	120	47.00±9.269	-9.865	0.000
	Yes	1080	55.73±9.192		
Course of treatment	I	264	57.55±9.086	72.581	0.000
	2	144	54.33±6.204		
	3	288	48.25±7.340		
	4	144	51.17±12.960		
	5	120	59.40±2.952		
	6	240	60.10±8.269		
Age	18~28	432	58.11±6.134	90.445	0.000
	29~38	288	57.00±12.478		
	39~49	480	50.65±8.466		
Children	No	528	57.27±10.620	7.704	0.000
	Yes	672	52.96±8.163		
Disease type	I	288	49.83±9.563	93.736	0.000
	II	816	56.61±7.767		
	III	75	49.20±13.371		
	IV	23	74.30±3.336		
Operation	No	144	59.00±5.496	8.564	0.000
	Yes	1056	54.30±9.857		

Abbreviation: M, mean.

Table 2 Correlation Among Variables

Variable	M	SD	1	2	3	4
1. Reproductive concerns	54.860	9.562	1			
2. Fear of recurrence	72.400	27.751	0.769**	1		
3. Psychological resilience	26.600	20.193	-0.798**	-0.774**	1	
4. Coping style	12.130	10.179	-0.641**	-0.611**	0.587**	1

Note: **P<0.01.

Abbreviations: M, mean; SD, standard deviation.

Mediating Effect Analysis

First, the bias problem of the standard method is tested by a single-factor test. The results show that there are 11 factors with characteristic roots more significant than 1, among which the variance explained by the first factor is 29.034%, which is less than the critical standard of 40%. It shows that there is no serious common methodology bias in this study.

Secondly, reproductive concerns were taken as the dependent variable, the patient's fear of recurrence as the independent variable, and psychological resilience and coping styles as the mediating variables. Six variables with statistical significance in Table 2 were taken as covariables, and model 6 in the Process was used to investigate the mediating effects of psychological resilience and coping styles on the fear of recurrence and reproductive concerns, respectively. The results of multiple linear hierarchical regression analysis are shown in Table 3.

Finally, the PROCESS program prepared by Hayes was used to test the mediating effect. After controlling the general data such as age, spouse, children, operation, disease type, and chemotherapy course, the mediating effect of psychological resilience and coping style on the fear of recurrence and reproductive concerns was analyzed. Model 6 was used to test the significance level of the mediating effect. Studies have shown that psychological resilience and coping styles play a significant mediating role between fear of recurrence and reproductive concerns. Table 4 presents the results of the chain mediation analysis for this study.

Table 3 Multiple Linear Hierarchical Regression Analysis of the Chain Mediation Model Between Psychological Resilience and Coping Style and Fear of Recurrence and Reproductive Concerns in Breast Cancer Patients of Childbearing Age

Variable	1			2			3		
	β	t	p	β	t	p	β	t	p
Constant	31.105	28.401	<0.001	44.411	35.939	<0.001	48.165	38.532	<0.001
Age	-1.793	-8.280	<0.001	-0.759	-3.760	<0.001	-0.794	-4.086	<0.001
Spouse	3.984	6.130	<0.001	2.103	3.568	<0.001	2.335	4.113	<0.001
Children	0.523	1.395	0.163	0.679	2.031	0.043	0.716	2.222	0.026
Operation	0.561	1.066	0.287	0.654	1.395	0.163	0.327	0.722	0.47
Disease type	2.576	8.858	<0.001	2.091	8.018	<0.001	1.914	7.605	<0.001
Course of treatment	0.484	5.157	<0.001	0.481	5.751	<0.001	0.499	6.198	<0.001
Fear of recurrence	0.230	30.529	<0.001	0.128	14.498	<0.001	0.102	11.426	<0.001
Psychological resilience				-0.212	-17.569	<0.001	-0.187	-15.686	<0.001
Coping style							-0.176	-9.768	<0.001
R	0.807			0.851			0.863		
R ²	0.650			0.724			0.744		
F	318.908			389.653			384.419		
p	<0.001			<0.001			<0.001		

Note: β is the standardized regression coefficient.

Table 4 Test Results of Bootstrap Mediation Effect

Effect Relationship	Effect Value	LLCI	ULCI	Effect Ratio
Total effect	0.230	0.215	0.245	
Direct effect	0.103	0.085	0.120	44.80%
Total indirect effect	0.127	0.116	0.140	55.20%
Fear of recurrence→psychological resilience→reproductive concerns	0.089	0.078	0.100	38.70%
Fear of recurrence→coping style→reproductive concerns	0.026	0.020	0.034	11.30%
Fear of recurrence→psychological resilience→coping style→reproductive concerns	0.012	0.008	0.016	5.20%

Discussion

In this study, we used a chain mediation model to explore the relationship between psychological resilience, coping styles, fear of recurrence and reproductive concerns. As hypothesized, both psychological resilience and coping styles partially modulate the relationship between fear of recurrence and reproductive concerns. In addition, psychological resilience and coping styles showed a chain-mediated effect in the association between fear of recurrence and reproductive concerns. The robustness of the mediation analysis was verified by Bootstrap analysis.

According to the results of univariate analysis. This paper's reproductive concerns score is (54.86 ± 9.562), which is different from Ren Hailing's research.²⁴ The worry level is higher than in other studies, which may be collect the crowd younger, and the study population is mostly highly educated, in the confirmed birth, resulting in this part of patients fertility worry higher. The other part of the patients with high reproductive concerns are mostly those with one child. Due to the traditional concept of childbearing in China, these patients still have a need for childbearing. However, the worry about the health of themselves and their children after treatment, and the uncertainty of recurrence make them higher level of reproductive concerns.

According to the results of Pearson analysis, there is a positive correlation between the fear of recurrence and reproductive concerns in breast cancer patients of childbearing age. Previous studies have also found similar findings.^{11,25,26} Because the current reproductive health care in China is still in the initial stage, women with cancer still have specific deficiencies in the depth and breadth of access to childbearing information. The research results of

Vanstone et al²⁷ show that female cancer patients of childbearing age have a relatively high demand for reproductive protection knowledge. In the absence of information about fertility and disease, uncertainty and panic about a recurrence of the disease can further exacerbate fertility concerns for women with cancer.

According to the Process results, psychological resilience has a mediating effect of 38.7% between the fear of recurrence and reproductive concerns. In stress responses such as stress and adversity, psychological resilience helps individuals resist or buffer the damage caused by stress and also helps individuals return to normal psychology and realize self-growth. The resource conservation theory²⁸ holds that disease will deplete individual psychological resources. Due to the limited nature of overall psychological resources and the difficulty of replenishing them in a short period, if the consumption of internal resources cannot be replenished in time, the mobilization will be blocked after exhaustion, leading to the appearance of anxiety symptoms. The survey objects of this study are primarily young women who find it difficult to adjust their state to cope with the adverse reactions of disease and treatment. At the same time, elderly patients have better social adaptability and personal growth ability; most of them have experienced a lot of hardships and setbacks and have better adaptability to cope with cancer and adverse reactions in the course of cancer than young patients.

Meanwhile, studies have shown²⁹ that high psychological resilience can effectively inhibit the activity of the medial prefrontal cortex of the amygdala and protect individuals from psychological damage. Therefore, a high level of psychological resilience can significantly reduce the impact of fear of recurrence on reproductive concerns. Future research should pay more attention to the psychological resilience of the breast cancer childbearing age group.

According to the Process results, the coping style also has a mediating effect of 11.3% between the fear of recurrence and reproductive concerns. When patients face the disease, their coping style correlates with their emotional state, and patients who adopt the active style tend to generate more positive emotions. On the contrary, negative coping styles are positively correlated with negative emotions. Pan Xiao³⁰ found that medical coping strategies and social support have a significant impact on the mental toughness of cancer patients, indicating that patients are more inclined to choose facing strategies. According to the research of Yang Li³¹ et al, when patients choose to use negative coping means, they are more likely to choose facing strategies. They often prefer to avoid treatment, which not only makes the condition worse but also makes it more likely to trigger more severe negative emotions. Studies have pointed out³² that individuals can flexibly improve or suppress emotions by adopting corresponding coping measures according to the situation. Therefore, positive and effective coping methods can significantly reduce the impact of fear of recurrence on reproductive concerns.

According to the Process results, psychological resilience and coping styles have a chain mediating effect of 5.2% between fear of recurrence and reproductive concerns. As an internal coping resource to adapt to the cancer process, psychological resilience has a non-negligible impact on negative emotions. Meanwhile, Shelley and Annette's stress process theory³³ argued that coping resources were potential mediating factors in the stress process. Therefore, according to their value orientation, psychological resilience is actively adjusted, and positive countermeasures are adopted to achieve a positive attitude. In the future, clinical workers engaged in nursing work can try to take psychological resilience as the entry point and guide individual psychological adjustment through cognitive intervention and acceptance commitment therapy so as to reduce the reproductive concerns of breast cancer patients in childbearing age.

We verify the conceptual framework and three hypotheses based on the chain mediation model. Notably, psychological resilience and coping styles have a partially mediating effect, suggesting that both make a meaningful contribution to how fear of recurrence affects reproductive concerns. These findings highlight the multifaceted nature of reproductive concerns and the need to consider both intrinsic and extrinsic resources when addressing patients' reproductive concerns. The inclusion of psychological resilience and coping styles in reproductive concerns improvement programs may lead to a more comprehensive and inclusive approach to reproductive concerns improvement. The study has several advantages. First, to our knowledge, this is the first study to examine the chain-mediated effects of psychological resilience and coping styles involved in fear of recurrence and reproductive concerns. Secondly, by integrating resilience and coping styles as intermediaries, this study provides a new perspective on the psychological mechanism of fear of recurrence affecting reproductive concerns. However, the study has several limitations:

1. The cross-sectional design used in this study may limit the causal relationship between key variables. Longitudinal design of causal effects can be investigated in future studies.
2. The mediating effect is about 55.20%, which indicates potential unobserved effects and mechanisms. Future studies should explore more possible factors.
3. Due to the potential bias of self-reported data, the information filled in may have a particular subjectivity and produce bias.

Therefore, such questionnaires can be optimized in the future, and some sensitive indicators and measurement items can be explored and added to be more comprehensive and objective.

Conclusion

Based on cross-sectional data and a chain mediation model, this study explores the mechanisms between fear of recurrence, psychological resilience, coping styles, and reproductive concerns. The results of the study revealed a correlation between these four factors. Psychological resilience and coping style partially mediate the effects of fear of recurrence on reproductive concerns, and there is a chain mediation effect between fear of recurrence and reproductive concerns. The results of this study are of great significance for improving reproductive concerns in breast cancer patients of childbearing age.

Data Sharing Statement

The datasets generated for this study are available on request to the corresponding author.

Ethics Approval and Consent to Participate

All methods were carried out in accordance with the Declaration of Helsinki. Written informed consent was obtained before data collection from the participants. This study was approved by the Ethics Committee of Bengbu Medical College. (Approval number: [2023] No. 280).

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Disclosure

The authors declare that they have no conflicts of interest in this work.

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