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ORIGINAL RESEARCH

Cancer Recurrence Fear and Return to Work in Breast Cancer Survivors:The Mediating Effects of Health Literacy

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Purpose: This study investigates the relationships between breast cancer survivors' return to work, health literacy, and cancer recurrence fear. By employing structural equation modeling, we examine the mediating effect of health literacy on the interplay between cancer recurrence fear and the ability to return to work.

Patients and Methods: We conducted a survey involving 190 breast cancer survivors, utilizing a general information questionnaire, the Concern About Recurrence Scale, and the Health Literacy Management Scale.

Results: Our findings indicate that only 54.2% of the participants successfully returned to work. Notably, health literacy was positively correlated with return to work (r=0.315, p<0.001), whereas fear of cancer recurrence was negatively correlated (r= −0.268, p<0.001). The mediation effect model demonstrated a good fit, confirming that health literacy partially mediates the relationship between cancer recurrence fear and return to work (β= −0.024, p< 0.001).

Conclusion: The findings highlight a concerning situation for breast cancer survivors regarding their return to work. Cancer recurrence fear significantly impacts their ability to re-enter the workforce, both directly and indirectly through health literacy. We recommend that healthcare providers focus on alleviating anxiety related to cancer recurrence and enhancing health literacy to support survivors in their reintegration into society.

Keywords: breast cancer survivors, return to work, health literacy, cancer recurrence fear, mediating role

Introduction

According to 2022 data released by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO), 2.29 million new cases of breast cancer are diagnosed annually, making it the most common cancer globally.[1] Advancements in medical treatments and diagnostic techniques have significantly improved the survival rate of breast cancer patients. According to recent cancer survival statistics, the five-year survival rate for breast cancer patients can reach 90%.[2] The onset age of breast cancer is trending towards younger demographics. A relatively high proportion of cases now occur among middle-aged and younger patients.[3] In China, the peak incidence age for breast cancer among

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women is between 45 and 59 years, approximately 10 years earlier than in Western countries.[4] Young women are often at a critical juncture in their careers and family lives. This necessitates psychological and social support that differs significantly from the needs of older women. As the number of young breast cancer survivors increases, more survivors of working age are needing to return to their jobs.

Return to work refers to the process by which patients resume their previous jobs or transition to other roles after leaving their positions due to illness or injury.[5] This process marks an important step towards rehabilitation, signifying the continuation of their previous lifestyle and daily activities. Return to work can enhance patients' physical, psychological, and social functions, as well as improve their overall quality of life.[6–8] Given the trend of earlier breast cancer onset in China, most women are diagnosed during critical stages of their family and career development. Such diagnoses can cause significant disruptions to family dynamics and labor productivity, the process of returning to work is crucial for both patients and society.

The return-to-work outlook for breast cancer survivors in China is concerning. In contrast, while over 70% of breast cancer survivors in Western countries successfully return to work,[9] the rate in Asian countries such as China and South Korea is less than 40%.[10,11] Studies indicate that 13.3% to 76% of Asian breast cancer survivors change their job roles, positions, or workplaces. Some maintain their roles but switch to less physically demanding and more intellectually focused tasks.[12] The duration of time taken to return to work ranges from 3 months to 8 years, with the majority returning within 3 years.[12] Furthermore, post-return work performance among breast cancer survivors declines compared to pre-diagnosis levels. Specifically, 37% report reduced work ability, increased work limitations, withdrawal behaviors, and heightened work stress.[13–15]

However, return-to-work not an immediate process. It is a complex, dynamic transition from illness to employment, influenced by numerous factors, including sociodemographic, disease-related, treatment-related, psychological, social support, work-related factors, and lifestyle behaviors.[16,17] In addition, the diagnosis, interventions, and treatments for breast cancer (eg, surgery, chemotherapy, radiotherapy, and hormonal therapy) may result in undesirable appearance-related side effects, such as the loss of one or both breasts, hair loss, and visible scarring, which can significantly impact body image (BI).[18–20] Impairments in BI can lead to diminished self-esteem among female patients, changes in social roles, and alterations in interpersonal relationships, which may contribute to prolonged absenteeism and difficulties in returning to work.[21]

BI is closely associated with a woman's thoughts and emotions and can strongly influence their behaviors, even several years after cancer treatment.[22,23] This can lead breast cancer patients to be in a state of chronic psychological stress for a long time. Fear of cancer progression or recurrence is a common and major emotional challenge among cancer survivors.[24] Studies indicate that the incidence of cancer recurrence fear among breast cancer survivors ranges from 55% to 99%[25–27] and persists throughout the disease course.[27] Prolonged fear and worry significantly affect a patient's professional life, creating obstacles for breast cancer survivors who are return-to-work.[17]

Health literacy is a set of knowledge and skills that enables individuals to obtain, communicate, process, and understand information and services in order to make appropriate health decisions, and to successfully navigate the health care system.[28] Studies indicate that improving health literacy in patients with chronic diseases is an effective educational and preventive measure that can enhance self-management behaviors and improve health outcomes.[29,30] For breast cancer patients, improved health literacy can positively impact their psychological well-being and subsequently enhance their quality of life.[31,32] High levels of health literacy help improve the health outcomes of cancer patients and facilitate their reintegration into society.[33,34]

Our earlier research demonstrated a correlation between concerns about cancer recurrence fear and health literacy related to the return to work among breast cancer patients.[35] However, the mechanism of interaction between these two variables in influencing the return-to-work remains unclear. Mediation effect analysis is a statistical method used to explore whether the impact of an independent variable on a dependent variable is mediated through one or more intermediary variables. This analytical method aims to uncover the underlying mechanisms between variables, specifically how an independent variable affects a dependent variable through mediating variables. Mediation effect analysis not only aids in understanding the relationships between variables but also provides deeper insights into phenomena.

To address the knowledge gap, this study aims to investigate the relationship between cancer recurrence fear and return to work among breast cancer survivors, as well as the mediating role of health literacy in this relationship. We hypothesize that higher levels of cancer recurrence fear are associated with lower rates of return to work among breast cancer survivors, and that this relationship may be mediated by health literacy.

Participants and Methods

Research Participants

This study employs a cross-sectional research design. Utilizing a convenience sampling method, surveys were conducted from June 2019 to August 2022 among breast cancer survivors at the Sun Yat-sen University Cancer Center and the Affiliated Cancer Hospital and Institute of Guangzhou Medical University in Guangzhou. The inclusion criteria were as follows: (1) Pathologically confirmed breast cancer diagnosis; (2) Diagnosis duration over 1 month; (3) Aged 18–60 years; (4) Employed before diagnosis; (5) Aware of their condition, provided informed consent, and voluntarily participated.The exclusion criteria were as follows: (1) Clinical stage IV; (2) Distant metastasis or metastatic cancer; (3) Severe cognitive or mental disorders; (4) Severe systemic infections, anemia, cachexia, or other severe complications.

Based on Kendall's sample size estimation method, the size was estimated based on factor analysis, which indicated that the sample size should be 5–10 times the number of items. The Concern About Recurrence Scale includes 29 items, and the sample size is increased by 20%;[36] Therefore, the sample size was 174–348, considering the possibility of fewer items and invalid responses in the questionnaire.

This study was approved by the Ethics Committee of the relevant administrative department (Approval No: GYX2020-003), and all participants gave informed consent and signed written consent forms.

Data Collection

Between June 2019 and August 2022, breast cancer survivors who met the inclusion and exclusion criteria were assessed for eligibility. The trained and experienced researchers explained the research purpose, procedures, potential risks and benefits to the participants before the survey and ensured their confidentiality and voluntary participation. Each participant signed the informed consent form and completed the self-report survey, including demographics, Concern About Recurrence Scale and the Health Literacy Management Scale.

The data collection and analysis were conducted by two master's students who are not affiliated with the department, specializing in breast cancer care. Before the study commenced, the project leader provided a 60-minute training session for the researchers involved in the questionnaire survey and data analysis. This training covered key topics, including ethical considerations, effective online communication skills, and the criteria for questionnaire exclusion, with detailed explanations of each item in the questionnaire to ensure clarity. The comprehensive training, delivered through theoretical lectures and interactive discussions, ensured that the researchers fully understood the study's objectives and significance, thereby preventing any ambiguities during the research process.

Participants were recruited through WeChat groups of hospitalized breast cancer patients in two hospitals. Interested individuals could add the research personnel for further information, and the researchers would provide detailed explanations to the participants. Participants were required to complete the informed consent form on the first page of the questionnaire before proceeding to fill it out. After collecting the questionnaires, the researchers analyzed the responses, deeming any questionnaire invalid if it had a response time of less than 2 minutes, exhibited a highly regular response pattern, failed to answer all required questions, or did not meet the inclusion and exclusion criteria.

Measurements

General Information Questionnaire

The general information questionnaire collected socio-demographic data and disease-related information. General demographic characteristics included the following: gender, age, educational level, marital status, income, medical burden, employment type, work intensity, salary level and work stress; disease-related information included the following: diagnosis, surgical method and presence of chronic diseases.

Concern About Recurrence Scale (CARS)

Developed by Vickberg et al in 2003,[37] was later translated and revised into Chinese by Cai Jianping.[38] This scale is primarily used to assess the levels of concern regarding cancer recurrence among patients. It consists of 29 items divided into 5 dimensions: overall fear, health worries, womanhood worries, role worries, and death worries. The total score ranges from 4 to 124, with higher scores indicating greater concern about cancer recurrence. The Cronbach's alpha coefficient for the entire scale is 0.912, while for individual dimensions, it ranges from 0.638 to 0.871.

Health Literacy Management Scale(HeLMS)

This scale was developed by Chinese scholar Sun Haolin[39] and is based on the Health Literacy Management Scale (HeLMS) created by Professor Jordan et al in Australia. This scale was formulated through translating questionnaires, making modifications, and conducting qualitative interviews. It consists of 24 items spanning four dimensions: Access to health information, Communication skills, Attitude towards health, Economic support. Each item is scored on a 5-point Likert scale, contributing to a total score of 120 points. Higher scores indicate greater health literacy, with a score of ≥96 points suggesting preliminary health literacy competency. Cronbach's alpha coefficients for the dimensions range from 0.857 to 0.940, with a test-retest reliability of 0.683.

Data Analysis

Data analysis was performed using SPSS 29.0 and AMOS 26.0. Demographic variables and questionnaire scores were presented as count and percentage, or mean and standard deviation. Normality of the data was tested using the Kolmogorov–Smirnov test. For normally distributed data, independent sample *t*-tests and ANOVA were employed for univariate analysis. Spearman correlation analysis was used to explore relationships between variables, with the significance level set at α=0.05. Structural equation modeling was constructed using AMOS, followed by model testing and revision, and mediation effect testing using the Bootstrap method.

Results

Participant Characteristics

In this study, a total of 215 questionnaires were distributed, and 190 valid responses were received, with an effective recovery rate of 88.37%. Among the 25 invalid questionnaires, 14 indicated that the patients were unemployed prior to diagnosis, 6 had a response time of less than 2 minutes, and 5 were identified as exhibiting a highly regular response pattern. All 190 breast cancer patients were female. The primary surgical methods were modified radical mastectomy (80, 42.1%) and breast-conserving surgery (56, 29.5%). Postoperatively, 116 patients (61.1%) received adjuvant chemotherapy, and the majority are still undergoing treatment (148, 77.89%). Of the patients, 87 (45.8%) have not returned to work, while 103 (54.2%) have resumed working. The average time from diagnosis to return-to-work was 7.06±5.63 months. Among those who returned to work, 39.5% resumed their previous full-time jobs. After falling ill, 5.8% (11/190) of the patients changed careers, 33.7% (64/190) have not yet returned to work, and 12.1% (23/190) stated they do not plan to work now or in the future. Among those who have returned to work, 91.3% (94) are engaged in mental labor. For most patients (59, 57.3%), work intensity decreased compared to pre-diagnosis levels, while salary levels remained the same (59, 57.3%). Most patients reported mild work stress (45, 43.7%) or no work stress (36, 33.0%). (Table 1).

Correlation Between Breast Cancer Survivors' Return to Work, Cancer Recurrence Fear and Health Literacy

Spearman correlation analysis indicated that return-to-work is significantly negatively correlated with the cancer recurrence fear (r=−0.268, P<0.001) and significantly positively correlated with health literacy (r=0.315, P<0.001). Moreover, Cancer recurrence fear is significantly negatively correlated with health literacy (r=−0.342, P<0.001) (Table 2).

Table 1 General Information of Breast Cancer Patients (n=190)

Variables		N, %	Variables		N, %
Age			**Presence of Chronic Diseases**		
	<30	9 (4.7)		None	162 (85.3)
	31~40	59 (31.1)		Yes	28 (14.7)
	41~50	90 (47.4)	**Employment Status**		
	>50	32 (16.8)		Full-time, continuing pre-surgery employment	75 (39.5)
Educational Level				Career change post-illness	11 (5.8)
	Elementary School or Below	8 (4.2)		Part-time, continuing pre-surgery employment	17 (8.9)
	Middle School	32 (16.8)		Not yet returned to work	64 (33.7)
	High School	34 (17.9)		No current or future employment plans	23 (12.1)
	Associate's Degree and Bachelor's Degree	106 (55.8)	**Employment Type**		
	Master's Degree and Above	10 (5.3)		Unemployed	87 (45.8)
Marital Status				Mental Work	94 (49.5)
	Single	11 (5.8)		Physical Work	9 (4.7)
	Married	168 (88.4)	**Work Intensity**		
	Divorced	10 (5.3)		Unemployed	87 (45.8)
	Widowed	1 (0.5)		Decrease	59 (31.1)
Income				Similar	41 (21.6)
	<2000	14 (7.4)		Increase	3 (1.6)
	2000~40000	30 (15.8)	**Salary Level**		
	>4000	146 (76.8)		Unemployed	87 (45.8)
Medical Burden				Decrease	37 (19.5)
	Unable to Afford	18 (9.5)		Similar	59 (31.1)
	Barely Able to Afford	74 (38.9)		Increase	7 (3.7)
	Mostly Able to Afford	81 (42.6)	**Work Stress**		
	Fully Able to Afford	17 (8.9)		Unemployed	87 (45.8)
Diagnosis				None	36 (18.9)
	Left Breast Cancer	91 (47.9)		Mild	45 (23.7)
	Right Breast Cancer	94 (49.5)		Moderate	19 (10.0)
	Bilateral Breast Cancer	5 (2.6)		Severe	3 (1.6)
Surgical Method					
	Modified Radical Mastectomy	80 (42.1)			
	Simple Mastectomy with Sentinel Lymph Node Biopsy	54 (28.4)			
	Breast-Conserving Surgery	56 (29.5)			

Mediating Effect of Health Literacy on the Relationship Between Cancer Recurrence Fear and Return to Work

A structural equation model was constructed using concerns about cancer recurrence fear as the independent variable, health literacy as the mediating variable, and return-to-work status as the dependent variable. The maximum likelihood

Table 2 Correlation Analysis Between Return to Work, Cancer Recurrence Fear, and Health Literacy Among Breast Cancer Survivors (n=190)

Variables	Return to Work Status	Cancer Recurrence Fear	Health Literacy
Return to Work Status	—	−0.268**	0.315**
Cancer Recurrence Fear	−0.268**	—	−0.342**
Health Literacy	0.315**	−0.342**	—

Notes: **P<0.001.

method was used to fit the model. The fit indices for the revised model are: $\chi 2/df=3.725$, RMSEA=0.120, CFI=0.926, TLI=0.899, and IFI=0.927. All indices fall within acceptable ranges, indicating the model's validity (Figure 1).

The mediating effect was tested using the bootstrap method with 5000 resamples. Results indicated that the confidence intervals (95% CI) for the total effect (−0.069 to −0.024), direct effect (−0.062 to −0.011), and indirect effect (−0.025 to −0.002) of Concerns about Cancer Recurrence on return-to-work all excluded zero. This suggests that health literacy partially mediates the relationship between fear of cancer recurrence and return to work, with the mediating effect accounting for 21% of the total effect (Table 3).

Discussion

This study reveals that the return-to-work rate for breast cancer survivors in China is relatively low. The results indicate that cancer recurrence fear acts as a barrier, whereas health literacy serves as a facilitator for these survivors to return-to-work. Moreover, health literacy partially mediates the relationship between cancer recurrence fear and the return to work, with an indirect effect accounting for 21% of the total effect. To our knowledge, this is the first study to explore the mechanism involving health literacy in the context of concerns about cancer recurrence and return-to-work among breast cancer survivors, using these variables as the primary factors.

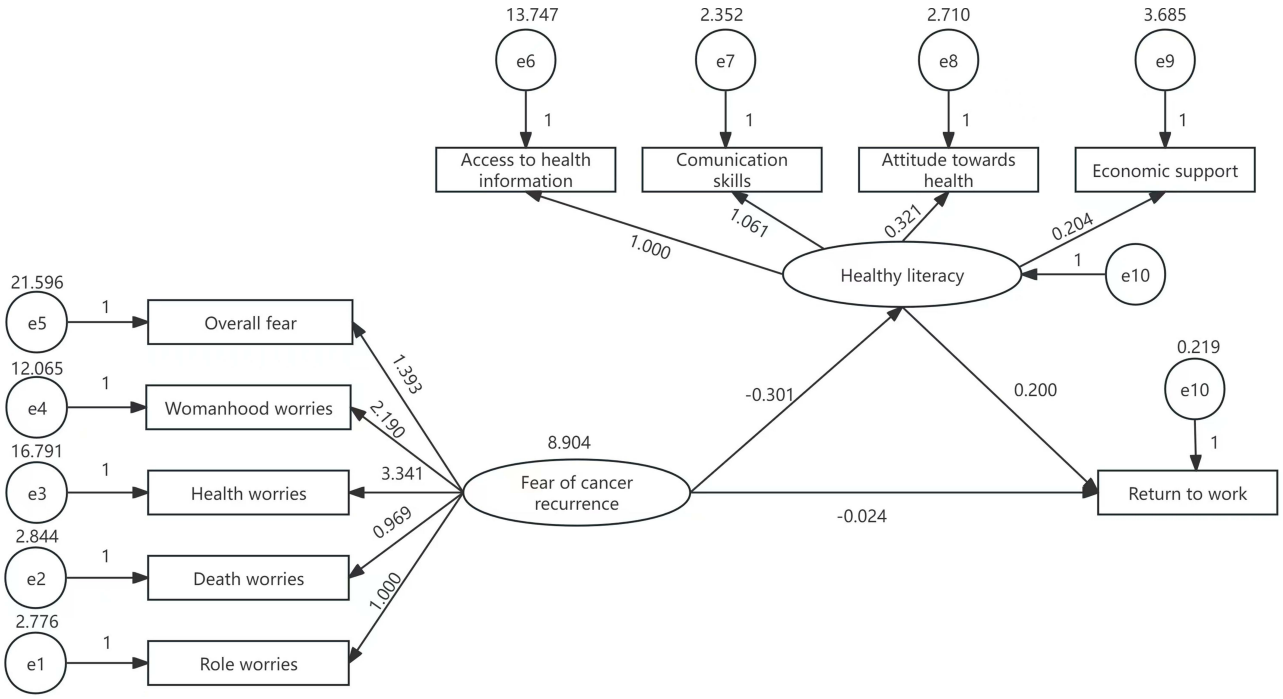

Figure 1 Fitted Model Illustrating the Mediating Role of Health Literacy.

Table 3 Mediating Effect of Health Literacy on Cancer Recurrence Fear and Return to Work Among Breast Cancer Survivors (n=190)

Item	Effect Size	Bootstrap 95% CI			Proportion of Effect
		Lower Limits	Upper Limits	p	
Indirect Effect	−0.010	−0.025	−0.002	0.010	21%
Direct Effect	−0.037	−0.062	−0.011	0.004	79%
Total Effect	−0.047	−0.069	−0.024	0.001	100%

Notes: Bootstrap Samples 5000.

Current Status of Return to Work Among Breast Cancer Survivors

In this study, only 54.2% of patients have returned to work, which is consistent with earlier study on Chinese breast cancer patients,[40] but lower than data from United States.[41] Compared to Western countries, the Asian population may have a lower level of awareness and acceptance regarding mental health issues, which can lead breast cancer survivors to require more time for psychological recovery before returning to work.[42] Although research on the return to work among breast cancer survivors has increased in recent years, the situation in China remains less optimistic. This finding underscores the importance of providing interventions and guidance to facilitate the return-to-work for breast cancer survivors.

Relationships Among Return to Work, Cancer Recurrence Fear, and Health Literacy in Breast Cancer Survivors

Relationships Between Return to Work and Cancer Recurrence Fear

Correlative analysis indicates a significant negative relationship between cancer recurrence fear and return-to-work among breast cancer survivors. Specifically, the higher the cancer recurrence fear, the lower the likelihood of return to work. Although cancer recurrence fear often overlaps with other forms of psychological distress, it remains an independent psychological issue separate from other mental disorders and negatively impacts patients' quality of life.[43,44] Even though cancer recurrence fear is common among cancer patients, breast cancer patients demonstrate significantly higher levels of this fear compared to those with other types of cancer.[45] Heightened levels of cancer recurrence fear intensify negative emotions[46] and can result in sleep disorders, decreased treatment adherence, social withdrawal, and social avoidance.[27,47,48] These factors serve as barriers to reintegration into society and the workplace for patients. A review and meta-analysis study[49] showed psychological Intervention (eg, cognitive-behavioral, emotionally expressive, art therapy, mindfulness, and web-based treatments) decrease psychological distress, promote relaxation, and modify the negative perception of one's body. Therefore, healthcare providers should promptly assess breast cancer survivors' needs and offer personalized psychological interventions to help them gain a thoroughly understand cancer knowledge and their condition. This will help them face cancer with an objective and correct attitude, reducing negative psychological effects such as worry about cancer recurrence.

Relationships Between Return to Work and Health Literacy

Positive correlations between health literacy and return-to-work indicate that breast cancer survivors with higher levels of health literacy are more likely to return-to-work. This may be because patients with high health literacy can better cooperate with and understand the health guidance provided by medical professionals. They also proactively seek help and advice during treatment. Patients with high health literacy tend to have stronger self-management capabilities for their illnesses and can utilize the health information they receive to adopt appropriate health-promoting measures,[50] making it possible for them to return-to-work. Currently, there is a lack of international research focusing on health literacy as a primary variable in studies about return-to-work for cancer patients. Future research should prioritize investigating the impact of health literacy levels on return-to-work among cancer survivors.

Relationships Between Cancer Recurrence Fear and Health Literacy

Correlation analysis reveals a significant negative relationship between cancer recurrence fear and health literacy among breast cancer survivors. The psychological stress associated with worrying about cancer recurrence is prevalent among breast cancer survivors and has a broad impact. Individuals with higher health literacy levels exhibit significantly lower worry about cancer recurrence.[51] Low health literacy can exacerbate the fear of cancer recurrence through multiple mechanisms. For example, patients with low health literacy may struggle to understand and process health-related information, have fewer interactions with healthcare providers, and show a greater tendency to avoid addressing their illness.[52] This finding is crucial for clinical practice and public health policy development. Future interventions should aim to enhance survivors' health literacy through improved health education and psychological support to effectively alleviate their cancer recurrence fear.

The Level of Health Literacy in Breast Cancer Survivors Partially Mediates the Relationship Between Cancer Recurrence Fear and Return to Work

A mediation model indicates that health literacy among breast cancer survivors partially mediates the relationship between cancer recurrence fear and return-to-work. The total effect of cancer recurrence fear on return-to-work is −0.047. Indirect effects account for 21% of the total effect. This indicates that concerns about cancer recurrence can directly affect whether breast cancer survivors return to work and indirectly affect this decision via health literacy. The study shows a negative correlation between cancer recurrence fear and return-to-work, suggesting that such concerns can diminish the influence of health literacy on return-to-work. This phenomenon may occur because patients, troubled by psychological issues like cancer recurrence, automatically block out external information. They highlight the complexity of patient engagement with health-related information and services, and lack disease-related knowledge, which reduces their confidence and courage to return to work. Patients with higher health literacy can effectively select, evaluate, and utilize health information and services, leading to a better psychological state, lower cancer recurrence fear,[52] and increased confidence in return-to-work. Therefore, it is recommended that healthcare professionals focus on health education and the management of negative emotions for patients with low health literacy. This approach can reduce negative psychological states like cancer recurrence fear and promote healthy behaviors.

Conclusion

This study shows that breast cancer survivors exhibit a low rate of return-to-work, significantly influenced by fears of cancer recurrence fear and health literacy. Health literacy serves as a mediator in the relationship between concerns about cancer recurrence and the likelihood of return to the workforce among breast cancer survivors. Clinical caregivers should focus on the needs of patients and the impact of negative emotions, including fears of recurrence, on their well-being. Enhancing patients' health literacy and developing intervention plans accordingly can help breast cancer survivors reintegrate into the workforce.

Study Limitations

Our study has several limitations. First, the sample size is relatively small, as it includes only breast cancer survivors treated in Guangzhou. This limitation affects the representativeness and generalizability of the findings. Second, although structural equation modeling was employed to validate the relationships between variables quantitatively, this study is based on cross-sectional data alone. Future research should conduct longitudinal studies to explore factors influencing the return-to-work in breast cancer survivors. Third, the mediating role of health literacy is only partial, necessitating further investigation into the relationship between cancer recurrence fear and returning to work, accounting for other influencing factors. Fourth, due to the anonymity and voluntary nature of participation, we cannot identify those who chose not to participate, and we did not collect information about non-participants. As a result, it is impossible to analyze their characteristics or reasons for non-participation. This represents a limitation in our data collection process, and we may consider improvements in the future to better understand the factors influencing both participation and non-participation.

Data Sharing Statement

The datasets used in this study can be obtained from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

This study was approved by the Ethics Committee of the relevant administrative department (Approval No:GYX2020-003). Consent was directly obtained from the participants, and all participants signed an informed consent form.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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