

High social capital facilitates the alleviation of psychological distress in breast cancer patients: Insights from a cross-sectional study in Anhui Province, China

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SUMMARY Differences in social capital have been shown to impact psychological distress in cancer patients, but few studies have examined the relationship between social capital and the distress thermometer (DT) in breast cancer patients who have undergone modified radical surgery. To fill this research gap, our study aimed to investigate the association between social capital and the DT among breast cancer patients who underwent modified radical surgery in Anhui Province, China. This cross-sectional study used multi-stage stratified random sampling. Data on demographic characteristics, eight dimensions of social capital, and the DT were collected using a questionnaire. Logistic regression models were subsequently utilized to assess the relationship between social capital and DT, adjusting for confounding factors. A total of 253 participants were included in the final analysis. Results indicated that individuals with higher levels of social capital, including participation in the local community (OR = 3.437; 95% CI: 1.734-6.814), social agency or proactivity in a social context (OR = 69.700; 95% CI: 20.142-241.195), feelings of trust and safety (OR = 26.287; 95% CI: 7.646-90.374), neighborhood connections (OR = 7.022; 95% CI: 3.020-16.236), family and friend connections (OR = 59.315; 95% CI: 17.182-204.760), tolerance of diversity (OR = 9.785; 95% CI: 4.736-20.216), value of life (OR = 65.142; 95% CI: 19.994-212.242), and work connections (OR = 31.842; 95% CI: 12.612-80.397), had higher odds of reporting poor DT scores compared to those with lower levels of social capital. These findings indicate an association between social capital and DT scores in breast cancer patients who have undergone modified radical surgery, suggesting that social capital may play a crucial role in alleviating psychological distress within this community.

Keywords social capital, psychological distress, modified radical surgery for breast cancer, cross-sectional study, China

1. Introduction

Breast cancer is a significant public health concern worldwide. Nowadays, breast cancer is the most common cancer among women around the world and ranks first in the incidence of female malignant tumors in most countries or regions, including China (1). According to recent studies, breast cancer accounts for approximately 25% of all cancer cases and 15% of cancer-related deaths in women globally (2). The incidence of breast cancer varies in different countries or regions, and especially in developing countries or regions where the mortality rate for women with breast cancer is significantly higher than

in developed countries (3).

Breast cancer is associated with many factors, including family history and reproductive risk factors, early age of menarche, late age of menopause, older age of first birth, hormone replacement therapy after menopause, alcohol intake, and obesity (4). The age at which women are at risk of developing breast cancer also varies, but the majority of cases occur in women age 40 and older (5-7). Surgery is a preferred treatment option for most patients with early to mid-stage breast cancer. Modified radical surgery has emerged as a preferred procedure due to its less invasive nature compared to traditional radical surgery and its ability to partially

remove cancer lesions. However, modified radical surgery involves removing part or all of the patient's breast, which disrupts the local lymphatic and vascular circulation, leading to changes in appearance. Common adverse reactions such as lymphedema and local numbness can cause significant distress and pain. During the lengthy treatment process, breast cancer patients who undergo modified radical surgery often experience various forms of psychological distress, including depression, anxiety, pain, and social isolation. This psychological distress is a standard and adaptive reaction to unpleasant stimuli or threats (8), which seriously affect patients' quality of life and prognosis (9,10). Therefore, the psychological suffering of breast cancer patients who undergo modified radical surgery has gradually garnered the attention of many researchers (11-14).

Currently, the Social Capital Scale has good structural validity, internal consistency, reliability, and good external validity (15-17). The growing recognition of the social determinants of health has highlighted the importance of social capital in health research. Social capital consists of resources within a social structure that are utilized or activated for specific purposes. Moreover, one distinction that has gained currency dichotomizes social capital into "bonding" and "bridging" varieties. Specifically, bonding social capital refers to trusting and cooperative relations within homogeneous groups, while bridging social capital describes relationships between individuals who are dissimilar with respect to social identity and power (18). And social capital is further separated into individual and collective social capital. Individual social capital has been broadly defined as the ability of actors to secure benefits through membership in social networks and other social structures. In contrast, collective social capital is viewed as a collective feature and refers to the rules that promote collective action, and the former is reported to protect health more than the latter (17). Sufficient social capital promotes enhanced self-efficacy, which, in turn, assists patients in forming accurate cognitive assessments and improving their life satisfaction.

Psychological distress has been associated with reduced health-related quality of life (19,20), low satisfaction with medical care, and decreased treatment adherence (21,22). The US National Comprehensive Cancer Network (NCCN) guideline for distress management was the first to recommend screening all cancer patients with the Distress Thermometer (DT), a questionnaire specifically developed for cancer patients (23). Cancer patients could benefit from social support, which is useful in reducing anxiety, depression, and distress (24). A cross-sectional study in China noted both a higher rate and greater degree of psychological distress in patients with cancer (25). Strong social cohesion had a protective effect on the inverse association between social support and psychological distress, which, in turn, had a protective

effect on the indirect effect of social support on pain through psychological distress (26). Some researchers are reevaluating breast cancer treatment, placing greater emphasis on the influence of social contextual factors on the psychological well-being of patients who have undergone modified radical surgery. Studies of breast cancer patients have found that improving individual social capital can enhance cancer treatment compliance, help reduce cancer-related pain, and increase resilience to cancer side effects (27,28).

In addition, higher levels of social capital have been associated with better body image and overall life satisfaction among breast cancer patients (29). Social capital can help identify the unique needs and preferences of breast cancer patients, facilitating the creation of customized interventions to address the specific challenges that individuals or communities encounter. However, most previous studies examining the relationship between social capital and the distress levels of breast cancer patients have been conducted in developed or Eastern countries. There are few such studies in China, the largest developing country (30). For example, Kim *et al.* conducted a randomized controlled trial to explore the impact of an exercise adherence intervention with social capital on breast cancer survivors with moderate fatigue (31). A study in the US has discussed how social support can provide hope to cancer patients, concluding that family support, community support, and the support of health care providers is most effective in helping cancer patients integrate social capital (32). To fill this research gap and contribute to existing knowledge, the aim of the current study was to investigate the relationship between social capital and psychological distress among breast cancer patients who have undergone modified radical surgery in Anhui Province, China.

2. Materials and Methods

2.1. Study design and data collection

A cross-sectional survey was conducted in Anhui Province, eastern China, between August and December 2023. Ethical approval for this study was obtained from the Ethics Committee of Hefei Cancer Hospital, Chinese Academy of Sciences (No.YXLL-2024-35).

Three representative hospitals from Anhui Province, China, each with 100 patients, were randomly selected to represent the overall level of breast cancer patients who underwent surgery in Anhui Province: the First Affiliated Hospital of Anhui Medical University, the Second Hospital of Anhui Medical University, and the Chinese Academy of Sciences, Hefei Cancer hospital. Inclusion criteria were: 1) age 18 and older, 2) participants were not deaf or mute, did not have dementia or cognitive impairment, and were willing to participate in the survey, and 3) individuals who underwent modified radical

mastectomy for a pathologically confirmed diagnosis of breast cancer. Exclusion criteria were: 1) individuals with other primary tumors, 2) individuals with severe systemic infections or autoimmune diseases, and 3) individuals with an expected survival time of ≥ 6 months or a Karnofsky Performance Status (KPS) of ≥ 80 .

A total of 273 breast cancer patients who underwent modified radical mastectomy were included in the study. Structured face-to-face interviews were conducted by skilled or trained graduate students, with assistance from hospital staff. Of the 273 survivors who agreed to participate, 253 completed the entire survey and were eligible for analysis. Thus, the response rate was 92.67% (253 out of 273). The sampling process is outlined in Figure 1 below. Before beginning the investigation, the study's objectives and procedures were verbally communicated to each participant, ensuring that informed consent was obtained from all individuals.

2.2. Measures

2.2.1. Measurement of psychological distress

The DT, a brief 0–10 visual analogue scale, was developed to routinely assess psychological distress in cancer patients (33-35). The scale is a single-item

visual analog scale, where patients rate their pain level from 0 (no pain) to 10 (extreme pain), reflecting their pain experience over the past week. A score on the DT below either four or five, depending on the country and setting, has been propagated as an optimal cut-off to rule out significant distress in patients with cancer (34,36). Some studies have shown that the cut-off for intracranial tumors is six or higher, five for breast cancer patients who underwent modified radical surgery, and four for brain cancer patients. Given this, the cut-off for this study was chosen as five (37,38). Specifically, this study divided the participants into two groups based on their DT score, a low group (score of 0-4) and a high group (score greater than 4).

2.2.2. Measurement of social capital

Based on the World Bank's Social Capital Assessment Tool and previous works, a tool consisting of 36 items was used to assess social capital, the main independent variable (39). Responses were assessed using a 4-point Likert-type scale ranging from 1 (no, not at all) to 4 (yes, frequently), with higher scores representing higher levels of social capital. The scale consisted of 8 dimensions. Each dimension was calculated as the sum of its associated items, namely participation in the local

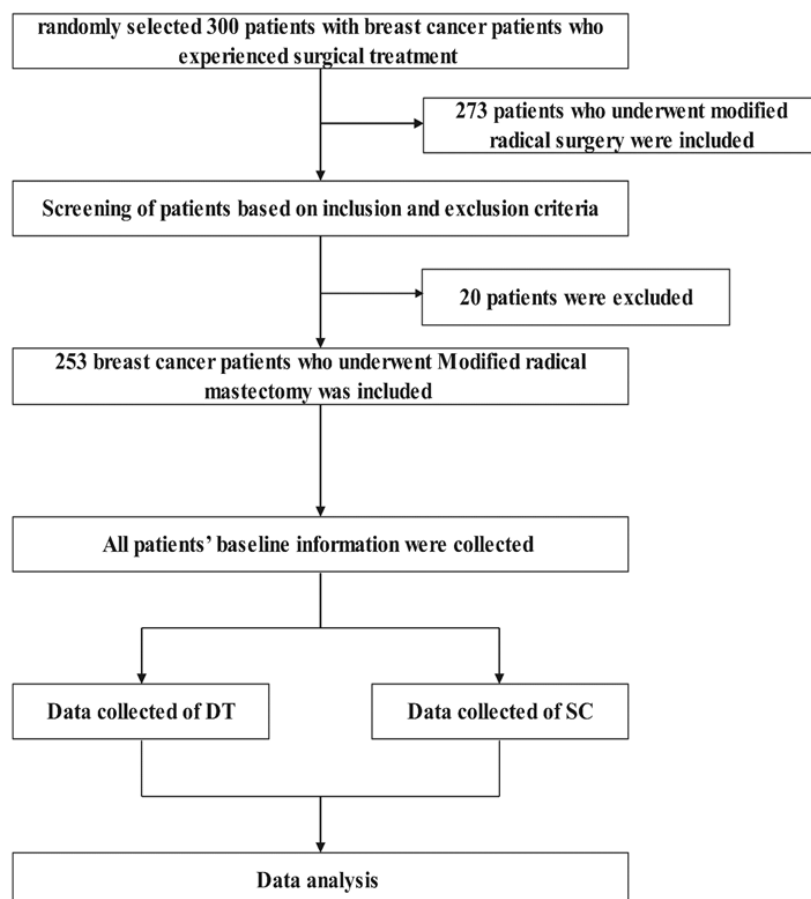


Figure 1. Flow chart for record selection.

community (range: 7-28), social agency or proactivity in a social context (range: 7-28), feelings of trust and safety (range: 5-20), neighborhood connections (range: 5-20), family and friend connections (range: 3-12), tolerance of diversity (range: 2-8), value of life (range: 2-8) and work connections (range: 3-12) (40). A point worth noting is that entries 35 and 36 do not count toward the scale total. In data analysis, the scores of each dimension of social capital were dichotomized into two categories by taking the median value as the cut-off (41,42). The Cronbach's α of the questionnaire was 0.964.

2.2.3. Measurement of other variables

Information on demographic and health-related variables was also collected. Essential demographic variables included name, age, marital status, level of education, breast cancer stage (based on the American Joint Committee on Cancer (AJCC) staging manual, 8th edition) (43), and treatment modality.

2.3. Statistical analysis

First, continuous and categorical variables were expressed as numbers and percentages, and then the difference between different DT groups (high DT versus low DT) and social capital (high SC versus low SC) was examined using a Chi-squared test. Second, a one-way ANOVA and Kendall correlation analysis were performed to assess the correlation between the DT and social capital. Third, a binary logistic regression model was used to further explore the interactive relationship between the DT and social capital. Social capital variables were coded with subjects having a lower level

as the reference group in all models. The results of the binary logistic regression analyses are reported as odds ratios (OR) and adjusted odds ratios (AOR), along with their respective 95% confidence intervals (95% CI).

All statistical analyses were performed using the statistical software SPSS 23.0 (SPSS Inc., Chicago, IL, USA). P value < 0.05 was considered to represent statistical significance in this study.

3. Results

3.1. Results of descriptive analysis

The characteristics of the participants are summarized in Table 1. In total, 253 breast cancer patients who underwent modified radical surgery were included in the data analysis. Participant characteristics included: age < 40 (17%), 40-49 (23.72%), 50-59(28.06%), 60-69 (22.13%), ≥ 70 (9.09%), unmarried (5.93%), married (69.57%), widowed or divorced (24.50%), with most having an education level of illiteracy. Approximately three-quarters (73.91%) of participants were classified as AJCC Stage 2. Statistical differences in age, education, and marital status were noted ($P < 0.01$).

Table 2 shows significant differences in DT scores among breast cancer patients who underwent modified radical surgery across all eight dimensions of social capital.

The Kendall's r correlation results are shown in Table 3, revealing significant negative correlations ($P < 0.01$). The correlation coefficients for each dimension were as follows: participation in the local community ($r = -0.279$), social agency or proactivity in a social context ($r = -0.675$), feelings of trust and safety ($r = -0.384$),

Table 1. Descriptive results for participant characteristics (N = 253)

Variables	N	Frequency (%)	DT		P-value*
			Low (≤ 4)	High (> 4)	
Age					< 0.01
<40	43	17.00%	22	21	
40-49	60	23.72%	45	15	
50-59	71	28.06%	44	27	
60-69	56	22.13%	17	39	
≥ 70	23	9.09%	9	14	
Level of education					< 0.01
Illiterate	102	40.32%	32	70	
Primary school	70	27.67%	39	31	
Junior school (High school)	58	22.92%	47	11	
Junior college and higher	23	9.09%	19	4	
Marital status					0.007
Unmarried	15	5.93%	10	5	
Married	176	69.57%	104	72	
Widowed or divorced	62	24.50%	23	39	
AJCC Stage					0.709
1	23	9.09%	12	11	
2	187	73.91%	104	83	
3	43	17.00%	21	22	

*Chi-squared test.

Table 2. Descriptive results for social capital and the distress thermometer (N = 253)

Variables	Total (N = 253)	DT		P-value*
		Low (≤ 4)	High (> 4)	
Participation in the local community				< 0.01
low	134	55	79	
high	119	82	37	
Social agency or proactivity in a social context				< 0.01
low	83	5	78	
high	170	132	38	
Feelings of trust and safety				< 0.01
low	53	9	44	
high	200	128	72	
Neighborhood connections				< 0.01
low	58	16	42	
high	195	121	74	
Family and friend connections				< 0.01
low	80	10	70	
high	173	127	46	
Tolerance of diversity				< 0.01
low	124	38	86	
high	129	99	30	
Value of life				< 0.01
low	141	34	107	
high	112	103	9	
Work connections				< 0.01
low	126	26	100	
high	127	111	16	

*Chi-squared test.

Table 3. Correlation between the distress thermometer and social capital

Factors ^a	1	2	3	4	5	6	7	8	9
1	1	0.321**	0.407**	0.363**	0.266**	0.29**	0.196**	0.258**	-0.279**
2	0.321**	1	0.426**	0.4**	0.738**	0.578**	0.606**	0.634**	-0.675**
3	0.407**	0.426**	1	0.505**	0.548**	0.408**	0.439**	0.361**	-0.384**
4	0.363**	0.4**	0.505**	1	0.58**	0.443**	0.278**	0.209**	-0.291**
5	0.266**	0.738**	0.548**	0.58**	1	0.643**	0.589**	0.564**	-0.568**
6	0.29**	0.578**	0.408**	0.443**	0.643**	1	0.524**	0.478**	-0.462**
7	0.196**	0.606**	0.439**	0.278**	0.589**	0.524**	1	0.744**	-0.676**
8	0.258**	0.634**	0.361**	0.209**	0.564**	0.478**	0.744**	1	-0.67**
9	-0.279**	-0.675**	-0.384**	-0.291**	-0.568**	-0.462**	-0.676**	-0.67**	1

^aFactor 1 = Participation in the local community; Factor 2= Social agency or proactivity in a social context; Factor 3 = Feelings of trust and safety; Factor 4 = Neighborhood connections; Factor 5 = Family and friend connections; Factor 6= Tolerance of diversity; Factor 7 = Value of life; Factor 8 = Work connections; Factor 9 = Distress thermometer. *P<0.05, **P<0.01.

neighborhood connections ($r = -0.291$), family and friend connections ($r = -0.568$), tolerance of diversity ($r = -0.462$), value of life ($r = -0.676$), and work connections ($r = -0.67$).

The results of the binary regression logistic analysis of the relationships between social capital and the DT are shown in Table 4. Among eight social capital dimensions, compared to reference groups, a higher level of social capital was linked to the DT. After adjusting for all covariate variables, in comparison to reference groups, higher levels of participation in the local community (OR = 3.437; 95% CI: 1.734 - 6.814), social agency or proactivity in a social context (OR = 69.700; 95% CI: 20.142 - 241.195), feelings of trust and safety (OR = 26.287; 95% CI: 7.646 - 90.374), neighborhood

connections (OR = 7.022; 95% CI: 3.020 - 16.236), family and friend connections (OR = 59.315; 95% CI: 17.182 - 204.760), tolerance of diversity (OR = 9.785; 95% CI: 4.736 - 20.216), value of life (OR = 65.142; 95% CI: 19.994 - 212.242), and work connections (OR = 31.842; 95% CI: 12.612 - 80.397) were associated with the DT, which indicated that a lower level of social capital was a risk factor for a higher DT score among breast cancer patients who underwent modified radical surgery.

4. Discussion

This study investigated the relationship between social capital and psychological distress among breast cancer

Table 4. Logistic analysis examining associations between the distress thermometer and social capital (N = 253)

Social capital dimensions	Unadjusted OR (95% CI)	Adjusted AOR (95% CI)
Participation in the local community		
low	Ref.	Ref.
high	3.183 (1.895-5.348)**	3.437 (1.734-6.814)**
Social agency or proactivity in a social context		
low	Ref.	Ref.
high	54.189 (20.470-143.452)**	69.700 (20.142-241.195)**
Feelings of trust and safety		
low	Ref.	Ref.
high	8.691 (4.012-18.827)**	26.287 (7.646-90.374)**
Neighborhood connections		
low	Ref.	Ref.
high	4.292 (2.253-8.176)**	7.022 (3.020-16.236)**
Family and friend connections		
low	Ref.	Ref.
high	19.326 (9.189-40.648)**	59.315 (17.182-204.760)**
Tolerance of diversity		
low	Ref.	Ref.
high	7.468 (4.270-13.063)**	9.785 (4.736-20.216)**
Value of life		
low	Ref.	Ref.
high	30.016 (16.461-78.801)**	65.142 (19.994-212.242)**
Work connections		
low	Ref.	Ref.
high	26.683 (13.533-52.609)**	31.842 (12.612-80.397)**

Adjusted Participation in the local community, Social agency or proactivity in a social context, Feelings of trust and Safety, Neighborhood connections, Family and friend connections, Tolerance of diversity, Value of life, Work connections. * $p < 0.05$. ** $p < 0.01$.

patients who underwent modified radical surgery in Anhui, China. Results revealed a negative association between social capital dimensions and DT scores. Specifically, individuals with higher levels of social capital exhibited less psychological distress. In addition, the interactive relationship between social capital and various variables related to psychological distress was identified in breast cancer patients who underwent modified radical surgery.

Breast cancer is one of the most common malignant tumors seriously affecting women's physical and mental health. It not only causes physiological pain but also often imposes great psychological pressure on patients because of the disfigurement it causes. Psychological distress can lead to the weakening of patients' cellular immune function, and the weakening of cellular immune function can lead to the emergence of more clinical discomfort in the patients, which affects their quality of life and the effectiveness of treatment, and it even has direct adverse effects on prognosis. Previous studies have shown that intervention in social factors can improve patients' quality of life and alleviate psychological distress (44-46). A cohort study in Sweden found that individuals living in neighborhoods with highly connected social capital may receive adequate health promotion information and adopt healthy behaviors due to trusting relationships between neighbors (47). In line with the current findings, prior studies have also found that improving individual social capital can enhance cancer treatment compliance, help reduce cancer-related pain, and increase resilience

to cancer side effects (27,28). The current study showed that a higher level of social capital was associated with less psychological distress, as corroborated by previous studies reporting that more social capital is linked to less likelihood of having psychological distress (16).

The current results indicated that psychological distress is correlated with age, level of education, and marital status in breast cancer patients who underwent modified radical surgery. However, there is a minimal association between psychological distress and the AJCC stage. One possible explanation is that female patients often exhibit a heightened concern for the implications of breast cancer itself, rather than the treatment process, due to their cognitively emotional reasoning. The relationship between social capital and psychological distress was investigated in breast cancer patients who underwent modified radical surgery. Findings revealed that various dimensions of social capital were associated with psychological distress in this patient population. For example, in this study, social support was defined as resources that are available to breast cancer patients who undergo modified radical surgery when they are in pain (42). Eight dimensions were utilized to evaluate social capital. This variation further highlighted the necessity to determine a universal and consent definition and measurement of social capital (48).

Moreover, all dimensions of social capital exhibit a significant negative correlation with psychological distress. One potential explanation is that advances in medical technology and improved care may provide

more significant social capital to support breast cancer patients who have undergone modified radical surgery, consequently reducing the risk of psychological distress. Conversely, patients with higher levels of social capital are more likely to receive support through engagement in formal or informal groups, voluntary activities, and community services, thereby alleviating psychological distress. Building upon the current findings, breast cancer patients who have undergone modified radical surgery should be encouraged to more actively engage in society to establish and maintain their social capital, enabling them to access increased social support and mitigate psychological distress.

Results of a logistic regression model indicated that participation in the local community, social agency or proactivity in a social context, feelings of trust and safety, neighborhood connections, family and friend connections, tolerance of diversity, value of life, and work connections were statistically associated with the psychological distress of breast cancer patients who underwent modified radical surgery, which also agrees with previous studies (49,50). Results from China demonstrated that social roles and functions of women are often limited by family, politics, and traditional cultural factors (16). For women with breast cancer, the scope of social capital and the level of social participation are more likely to be limited than those of healthy women and men (51). On one hand, the pain associated with breast cancer treatment significantly restricts the range of activities available to female patients and diminishes their social participation. On the other hand, post-surgical alterations to the body frequently lead to decreased self-esteem and heightened anxiety among female patients, further diminishing their social capital. In addition, a clinical trial involving patients with breast cancer in Iran found that after receiving social capital interventions, the occurrence of social capital in breast cancer patients had a positive impact on patients' psychology (27). In order to enhance the quality of life and alleviate psychological distress among breast cancer patients who have undergone modified radical surgery, programs or initiatives aimed at building and reinforcing social capital should be implemented. These efforts should focus on fostering participation in the local community, promoting social agency or proactivity, nurturing feelings of trust and safety, strengthening neighborhood connections, enhancing family and friend connections, fostering tolerance of diversity, promoting the value of life, and facilitating work connections. Such programs should involve support from family members, relatives, neighbors, and friends.

Our study has several notable strengths. First, prior research has established that, akin to other forms of cancer, breast cancer's high morbidity and mortality rates have significant psychological impacts, resulting in severe psychological reactions such as psychological distress in the majority of patients (9,10). To the extent

known, the current study is the first to present empirical evidence from a Chinese context regarding the influence of social capital factors on psychological distress among breast cancer patients. This study specifically proposes the establishment of a social support system encompassing community and familial support in order to foster increased communication between patients and their relatives, friends, and neighbors. This initiative seeks to cultivate a supportive community that is conducive to alleviating the adverse emotional experiences of patients. On the one hand, the findings of this study offer valuable insights into the role of social capital in the mental health of cancer patients. On the other hand, the findings of this study have the potential to enhance clinicians' comprehension of the psychological distress experienced by patients undergoing breast cancer treatment. In addition, future investigations could draw on these insights to improve the quality of life for breast cancer patients undergoing modified radical surgery by emphasizing the role of social capital in mitigating psychological distress. Second, a highly reliable and valid social capital scale was utilized. This scale encompasses eight dimensions that more accurately capture the characteristics of social capital, including trust, reciprocity, and social networks. Third, the representativeness of the sample was ensured through the implementation of a multistage sampling strategy and the inclusion of an appropriate sample size. The sampling process took into account the representation and influence of hospitals. This greatly contributed to the successful attainment of the study's objectives.

However, there are a few limitations that should be acknowledged. First, this was a cross-sectional study, which precluded determining the causality of social capital and the psychological distress of breast cancer patients who underwent modified radical surgery. A longitudinal study design is warranted for the future. Second, the generalization of these findings is limited since the study only involved breast cancer patients who underwent modified radical surgery in Anhui Province. Future studies that include larger areas and samples need to be conducted. Third, data in this study were based on self-reports and might be subject to a recall or reporting bias.

Finally, this study only analyzed the relationship between social capital and psychological distress in breast cancer patients who underwent modified radical surgery and did not include psychological distress and social capital in other cancer patients. Future research considering social capital in cancer patients may help to understand the role of social capital better and thus improve the quality of life of cancer patients.

5. Conclusion

In summary, the current study revealed an association between social capital and psychological distress among

breast cancer patients who underwent modified radical surgery. Specifically, higher levels of participation in the local community, social agency or proactivity in a social context, feelings of trust and safety, neighborhood connections, family and friend connections, tolerance of diversity, value of life, and work connections were associated with less psychological distress among breast cancer patients. Therefore, tailored attention should be given to breast cancer patients who have undergone modified radical surgery, and especially those from regions with varying levels of social capital. These findings should inform the formulation of strategies to enhance treatment, nursing, and rehabilitation services to mitigate damaging physical and psychological impacts, thus improving the quality of life of breast cancer patients who have undergone modified radical surgery.

Acknowledgements

The authors wish to thank the breast cancer patients who participated in this study.

Funding: This work was supported by grants from the Outstanding Research and Innovation Team Program of the Education Department of Anhui Province (no. 2023AH010036), the Outstanding Young Medical Talent Program, Hefei Cancer Hospital, Chinese Academy of Sciences, China (no. 2000000005), and the First Hospital Affiliated with Anhui Medical University's Foundation to Nurture Youth (2020kj21).

Conflict of Interest: The authors have no conflicts of interest to disclose.

Ethics approval and consent to participate: Ethical approval for this study was obtained from the Ethics Committee of Hefei Cancer Hospital, Chinese Academy of Sciences (No.YXLL-2024-35). All participants provided written informed consent before participating in the study. Participants were informed of the study's purpose, procedures, potential risks, benefits, and their right to withdraw at any time without penalty. Confidentiality and anonymity were maintained throughout the study, and all data collected were stored securely to protect participants' privacy. In addition, all methods used in this study are in accordance with the Declaration of Helsinki.

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Received June 22, 2024; Revised August 16, 2024; Accepted August 22, 2024.

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Released online in J-STAGE as advance publication August 25, 2024.