

Factors Influencing Breast Cancer Awareness in Rural Southwest China: A Cross-Sectional Study

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Background: This study aimed to explore the current knowledge level of breast cancer among rural women in Southwest China and analyze the influencing factors of breast cancer cognition.

Methods: From May to November 2022, 1468 rural women were invited to participate in this study. Demographic information and the Chinese version of the Breast Cancer Awareness Measure (C-BCAM) were collected through one-on-one investigations. The data were analyzed using descriptive statistics, chi-square tests, and multiple regression analysis in SPSS 26.0.

Results: The study included a total of 1468 rural women with a median age of 54.0 (IQR, 47.0, 60.0). The average score of breast cancer in the study population was 73.0 (IQR, 66.0, 82.0). Among women in Southwest China, the awareness rates of knowledge on breast cancer symptoms, barriers to seeking medical help, and risk factors were 68.8%, 98.4%, and 62.1%, respectively. The awareness rate was found to increase with higher education levels ($P < 0.001$) and decrease with increasing age ($P < 0.001$). Multivariate logistic regression analysis identified three variables that might influence breast cancer awareness: education level, contraceptive measures, and history of breast disease (all $P < 0.05$). Specifically, history of breast disease (Odds ratio (OR) = 1.907, 95% CI = 1.128 ~ 3.223), middle school education (OR = 2.155, 95% CI = 1.585 ~ 2.928), and junior college education and above (OR = 5.536, 95% CI = 1.898 ~ 16.148) were positive factors for women's breast cancer awareness. Conversely, the use of intrauterine devices (OR = 0.523, 95% CI = 0.384 ~ 0.712) was found to be a negative factor for women's breast cancer awareness.

Conclusion: This study highlights the insufficient awareness of breast cancer among women in rural area of Southwest China. It emphasizes the necessity of health education to improve female breast cancer awareness.

Keywords: China, breast cancer, awareness, screening, rural women

Introduction

Breast cancer is the most commonly diagnosed cancer worldwide and the leading cause of tumor-related deaths among women, as reported by the International Agency for Research on Cancer (IARC).¹ In China, breast cancer accounted for approximately 420,000 new cases and 120,000 deaths in 2020, representing 18.4% of global breast cancer cases.² Over the past three decades, breast cancer mortality has shown varying trends across different countries and regions.³ In China, the mortality rate of breast cancer has increased in both urban and rural areas from 2006 to 2020, with a more significant increase observed in rural areas (from 4.50/100,000 to 7.17/100,000) compared to urban areas (from 8.16/100,000 to 9.25/100,000).⁴ Consequently, the early diagnosis of breast cancer remain significant public health challenges, particularly in rural areas. Screening is considered the most effective approach to improve early detection, treatment, and reduce mortality rates associated with breast cancer.^{5,6} However, the

participation rate of rural women in breast cancer screening programs in certain areas of China is relatively low, indicating a need for improved compliance.⁷

Women's awareness of breast cancer plays a crucial role in influencing their screening behaviors. Previous studies have reported that increased health awareness promotes participation in breast cancer screening, which is vital for early detection.^{8,9} Several studies conducted in different regions of China have highlighted a lack of awareness regarding breast cancer symptoms and screening methods among women of appropriate age.^{10–12} However, these studies utilized non-standardized and varied questionnaires, leading to insufficient conclusions. In recent years, various tools have been developed worldwide to measure breast cancer awareness.^{13–15} Cancer Research UK developed a well-validated Breast Cancer Awareness Measure (BCAM) in 2010, which has been cross-culturally translated and introduced in Arab, Persian, and Malaysian countries, demonstrating reliability.^{16–18} In 2019, the Chinese version of BCAM (C-BCAM) was developed by Liu's research team. In this study, we conducted an investigation on breast cancer awareness using the C-BCAM questionnaire in a cross-sectional population from Southwest China. The aim was to assess the level of awareness regarding symptoms, risk factors, and barriers to seeking medical help related to breast cancer, as well as identify factors influencing this awareness.

Materials and Methods

Study Population

The participants were selected from the national “breast and cervical cancer screening program” for rural women in China. A total of 1468 rural women were recruited from May to October 2022 in Southwest China. The inclusion criteria were as follows: local permanent residents (residing for more than 1 year), no mental disorders or cognitive impairments, informed consent, and voluntary participation in the survey. Exclusion criteria included patients with other major diseases that would hinder their ability to complete the investigation properly.

This was a cross-sectional designed study, the sample size was estimated using the PASS 15.0 software package. Based on a literature survey, we set the expected frequency to 48%,¹⁹ the significance level to 0.05 (two-sided test), and the allowable error to 3%. Using these parameters, the sample size was calculated to be 1097. Considering that the questionnaire may be incomplete, at least 1372 were required in this study.

Data Collection

This study utilized a cross-sectional epidemiological survey approach. Women who provided informed consent were invited to participate in face-to-face investigations. Trained workers collected demographic characteristics using a self-designed questionnaire comprising 13 items, including age, marital status, education level, occupation, health care payment method, age at menarche, number of abortions, breastfeeding, contraceptive measures, use of hormonal drugs, history of breast disease, and smoking and alcohol consumption habits. Breast cancer awareness was assessed using the Chinese version of the Breast Cancer Awareness Measure (C-BCAM) questionnaire, which was developed by Linsell and translated by Liu et al. It has demonstrated good reliability and consistency in assessing breast cancer awareness among Chinese women, with a Cronbach's alpha value of 0.90 and alpha coefficients of 0.88, 0.84, and 0.94 in the three domains, respectively.

Scoring Scheme

The C-BCAM questionnaire consists of 26 items categorized into three aspects: knowledge of symptoms, barriers to seeking medical help, and knowledge of risk factors. Knowledge of breast cancer symptoms is scored on a four-point scale: zero = “refuse to answer”, one = “don't know”, two = “no”, and three = “yes”. Barriers to seeking medical care are rated on a reverse four-point scale: zero = “don't know”, one = “yes, often”, two = “yes, occasionally”, and three = “no”. The breast cancer risk factor section contains 15 items, each rated on a Likert's five-point scale ranging from one = “strongly disagreed” to five = “strongly agreed”. Total scores on the C-BCAM range from 15 to 108, with higher scores indicating higher breast cancer awareness. A score $\geq 60\%$ of the total was considered as aware, and the awareness rate was calculated as the number of aware individuals divided by the total number of participants, multiplied by 100%.

Statistical Analysis

Data were analyzed using SPSS 26.0. Categorical variables were presented as frequencies and percentages. Median (M) and interquartile range (P25, P75) were used to describe breast cancer cognitive scores. The chi-square test was employed to compare the differences in the rate of breast cancer awareness among populations with different demographic characteristics. Logistic regression analysis was performed to identify factors associated with breast cancer awareness. A *P*-value < 0.05 (two-sided) was considered statistically significant.

Results

Demographic Characteristics of Enrolled Participants

Table 1 presents the demographic characteristics of the study population. A total of 1468 women were included in the final analysis, with a median age of 54.0 (47.0, 60.0) years. The highest percentage of women was over 50 years old (62.7%). The percentages of women with education levels of elementary school and below, junior/senior high school, and college and above were 51.4%, 42.8%, and 5.7%, respectively. The majority of women had their menarche at ages 13–16

Table 1 Characteristics of Participants

Characteristics	Subgroup	No.	Proportion (%)
Age	<35 years old	96	6.5
	35~50 years old	451	30.7
	>50 years old	921	62.7
Marital Status	Married	1435	97.8
	Unmarried/divorced/widowed	33	2.2
Education level	Elementary School and below	755	51.4
	Junior/Senior High School	629	42.8
	College and above	84	5.7
Occupation	Housewife/Unemployed	560	38.1
	Manual laborer	683	46.5
	Brain workers	101	6.9
	Commercial workers	124	8.4
Medical Payment Methods	Self-funded	22	1.5
	Medical treatment for urban employees	109	7.4
	Urban residents' medical care	33	2.2
	New Rural Cooperative Medical Care	1304	88.8
Age at menarche	12 years old and below	191	13.0
	13–16 years old	952	64.9
	17 years old and above	325	22.1
Number of abortions*	0	457	31.1
	1–2 times	822	56.0
	3 times and above	181	12.3
Breastfeeding	None	76	5.2
	6 months and under	140	9.5
	7~12 months	1055	71.9
	13 months or more	197	13.4

(Continued)

Table 1 (Continued).

Characteristics	Subgroup	No.	Proportion (%)
Contraceptive measures*	No contraception	954	65.0
	Oral contraceptives	11	0.7
	Condoms	136	9.3
	Intrauterine device (IUD)	336	22.9
	Tubal or vasectomy	30	2.0
taking oral hormone medication	Yes	52	3.5
	No	1416	96.5
History of breast disease	Yes	172	11.7
	No	1296	88.3
Smoking	Yes	19	1.3
	No	1449	98.7
Drinking alcohol	Yes	227	15.4
	No	1241	84.5

Notes: *There are missing values.

(64.9%), had 1–2 abortions(56.0%), and breastfeeding for 7–12 months (71.9%). Additionally, 11.7% of women had been diagnosed with previous or current breast disease.

The Knowledge Level of Breast Cancer in the Study Population

Table 2 shows that the median score of breast cancer knowledge was 73.0 (IQR, 66.0, 82.0), with an overall awareness rate of 79.0%. The awareness rate for knowledge of symptoms was 68.8%, for barriers to seeking medical help was 98.4%, and for knowledge of risk factors was 62.1%. The corresponding median scores were 12.0 (IQR, 8.00, 15.0), 18.0 (IQR, 18.0, 18.0), and 46.0 (IQR, 38.0, 51.0), respectively.

Statistically significant differences in the level of breast cancer awareness were found among women with different ages, education levels, occupations, menarche ages, contraceptive measures, and history of breast disease (all $P < 0.05$) (Table 3). The awareness rate decreased with increasing age, with rates of 84.4% in the <35 years group, 83.1% in the 35–50 years group, and 76.4% in the >50 years group. However, the awareness rate increased with higher education levels, ranging from 72.5% in the elementary school and below group to 92.9% in the college and above group. Women with a history of breast disease had a higher awareness rate than those without (89.5% vs 77.6%, $P < 0.001$). The median C-BCAM scores also decreased with increasing age, with scores of 76.0 (70.0, 84.0), 75.0 (68.0, 83.0), and 71.0 (65.0, 81.0) for the <35 years group, 35–50 years group, and >50 years group, respectively. The awareness rates for women with a menarche age of <12 years old, using condom contraception, and with a history of breast disease were 79.1%,

Table 2 Scores and Awareness Rates of Different Dimensions of C-BCAM Questionnaire in Whole Population

Domains	Minimum* Score	Maximum* Score	Full Score**	Median Score (IQR)	Awareness Rate (%)
Total Score	33	108	0–108	73.0(66.0,82.0)	79.0
Knowledge of symptoms	4	15	0–15	12.0(8.00,15.0)	68.8
Barriers to Seeking Medical Help	0	18	0–18	18.0(18.0,18.0)	98.4
Knowledge of risk factors	19	75	0–75	46.0(38.0,51.0)	62.1

Notes: *The lowest and highest scores in this study. **Scorable range for this study.

Table 3 Univariate Analysis of Knowledge Rate and Awareness of Breast Cancer Prevention and Treatment

Characteristics		No. of Aware People (Awareness Rate) n (%)	C-BCAM Scores M (Q1, Q3)	χ^2	P
Age	<35 years old	81(84.4)	76.0(70.0,84.0)	9.999	0.007*
	35~50 years old	375(83.1)	75.0(68.0,83.0)		
	>50 years old	704(76.4)	71.0(65.0,81.0)		
Marital Status Married	Married	1135(79.1)	66.0(59.0,82.0)	0.217	0.642
	Unmarried/divorced/widowed	25(75.8)	72.0(64.5,82.5)		
Education level Below	Elementary School and below	547(72.5)	69.0(64.0,80.0)	43.177	<0.001*
	Junior/Senior High School	535(85.1)	75.0(68.0,83.0)		
	College and above	78(92.9)	81.0(74.0,88.8)		
Occupation	Housewife/Unemployed	452(80.7)	74.0(67.0,82.0)	9.921	0.019*
	Manual laborer	518(75.8)	70.0(65.0,80.0)		
	Brain workers	88(87.1)	80.0(71.5,86.0)		
	Commercial workers	102(82.3)	78.0(69.0,84.0)		
Medical Payment Methods	Self-funded	16(72.7)	70.5(64.0,75.3)	4.362	0.225
	Medical treatment for urban employees	94(86.2)	79.0(72.5,84.0)		
	Urban residents' medical care	27(81.8)	74.0(67.5,83.0)		
Age at menarche	New Rural Cooperative Medical Care	1023(78.5)	72.0(66.0,82.0)	7.882	0.019*
	12 years old and below	151(79.1)	73.5(65.0,82.0)		
	13–16 years old	770(80.9)	67.0(59.0,74.0)		
Number of abortions	17 years old and above	239(73.5)	64.0(57.0,70.0)	3.656	0.161
	0	347(75.9)	70.0(65.0,81.0)		
	1–2 times	658(80.0)	74.0(67.0,82.0)		
Breastfeeding	3 times and above	147(81.2)	73.0(67.0,82.0)	4.068	0.254
	None	57(75.0)	70.5(64.0,78.3)		
	6 months and under	119(85.0)	76.0(67.3,85.0)		
	7~12 months	827(78.4)	73.0(66.0,82.0)		
Contraceptive measures	13 months or more	157(79.7)	72.0(66.0,81.0)	21.069	<0.001*
	No contraception	764(80.1)	73.0(66.0,82.0)		
	Oral contraceptives	8(72.7)	67.0(61.0,74.0)		
	Condoms	122(89.7)	76.0(71.0,84.8)		
	Intrauterine device	241(71.7)	71.0(64.0,80.0)		
Tubal or vasectomy	24(80.0)	71.0(65.0,83.4)			

(Continued)

Table 3 (Continued).

Characteristics		No. of Aware People (Awareness Rate) n (%)	C-BCAM Scores M (Q1, Q3)	χ^2	P
Taking oral hormone medication	Yes	39(75.0)	74.0(64.0,82.0)	0.525	0.469
	No	1121(79.2)	73.0(66.0,82.0)		
History of breast disease	Yes	154(89.5)	76.0(68.5,83.0)	12.995	<0.001*
	No	1006(77.6)	73.0(66.0,82.0)		
Smoking	Yes	17(89.5)	76.0(68.5,83.0)	1.269	0.260
	No	1143(78.9)	73.0(66.0,82.0)		
Drinking alcohol	Yes	176(77.5)	72.0(65.0,82.0)	0.358	0.550
	No	984(79.3)	73.0(66.0,82.0)		

Note: * $P < 0.05$.

89.7%, and 89.5%, respectively. No significant differences were observed in the awareness rate based on marital status, medical payment methods, number of abortions, breastfeeding, take oral hormone medication, and smoking and drinking alcohol

There were statistically significant differences in the level of knowledge of breast cancer symptoms among women with different ages, marital status, education levels, and number of abortions (all $P < 0.05$) (Table S1). Similarly, there were statistically significant differences in knowledge of breast cancer risk factors among women with different ages, education levels, occupations, health care payment methods, age at menarche, number of induced abortions, contraceptive use, history of breast disease, and smoking (all $P < 0.05$) (Table S1).

Factors Influencing Breast Cancer Awareness Among Women with Different Demographic Characteristics

The results of multiple logistic regression analysis revealed that education level, contraceptive measures, and the presence of breast disease were independent factors influencing the level of breast cancer awareness ($P < 0.01$). Education level and the number of abortions were independent factors influencing the level of knowledge of breast cancer symptoms ($P < 0.05$). Education level, number of abortions, contraceptive measures, and the presence of breast disease were independent factors influencing the level of knowledge of breast cancer risk factors ($P < 0.05$). Please refer to Table S2 and S3 for detailed results.

Compared to women who did not use any contraceptive measures, the odds ratio (OR) of breast cancer awareness was 0.523 (95% CI: 0.384–0.712, $P < 0.001$) for women using intrauterine devices (IUDs) for contraception. Compared to women with an education level of elementary school and below, the ORs of breast cancer awareness were 2.155 (95% CI: 1.585–2.928, $P < 0.001$) for women with middle/high school education and 5.536 (95% CI: 1.898–16.148, $P = 0.002$) for women with college education or higher. Compared to women with no history of breast disease, the OR of breast cancer awareness was 1.907 (95% CI: 1.128–3.223, $P = 0.016$) for women with a history of breast disease. Please refer to Table 4 for specific values.

Discussion

Increasing awareness of breast cancer among women is crucial for promoting screening behaviors and early screening of breast cancer.²⁰ However, studies have shown that women in Asia and China have significantly lower levels of breast

Table 4 Multiple Logistic Regression Analysis of Breast Cancer Awareness Level

Factors		OR (95% CI)	P
Contraceptive measures	No contraception	Reference	
	Oral contraceptives	0.434(0.106~1.771)	0.244
	Condoms	1.316(0.677~2.5557)	0.419
	Intrauterine device	0.523(0.384~0.712)	<0.001*
	Tubal or vasectomy	1.063(0.422~2.676)	0.897
Education	Primary school and below	Reference	
	Junior/Senior High School	2.155(1.585~2.928)	<0.001*
	College and above	5.536(1.898~16.148)	0.002*
History of breast disease	No	Reference	
	Yes	1.907(1.128~3.223)	0.016*
Age	<35 years old	Reference	
	35~50 years old	1.465(0.752~2.855)	0.262
	>50 years old	1.219(0.612~2.428)	0.573
Age at menarche	12 years old and below	Reference	
	13~16 years old	1.173(0.784~1.755)	0.438
	17 years old and above	0.999(0.626~1.595)	0.997

Note: * $P < 0.05$.

cancer awareness compared to women in other countries.¹⁹ China, with its vast territory and uneven distribution of health resources, experiences differences in breast cancer awareness levels between urban and rural areas. Women in rural areas are often limited by economic development and literacy, resulting in a lack of knowledge about tumors.⁵ In response to this, China launched a breast cancer screening program for rural women aged 35–64 in 2009, using clinical breast examinations combined with ultrasound as the main screening tool.²¹ However, the rate of breast cancer knowledge awareness in rural areas was estimated to be only 29.3% to 64.0%.^{12,22,23}

In this study, we evaluated the level of breast cancer awareness among rural Chinese women using the standardized C-BCAM questionnaire. The findings indicate that rural Chinese women have poor knowledge about breast cancer diagnosis and treatment, especially regarding breast cancer risk factors, with an awareness rate of only 62.1%. The overall awareness rate in the study population was 79.0%, with an average score of 73.0 (IQR, 66.0, 82.0), which is consistent with findings from other research conducted in China, where the moderate score was 76.50 (IQR, 68.75, 84.00).^{11,24}

While the awareness rate of barriers to seeking medical care was high at 98.4%, indicating that most rural women in China have easy access to medical services, the basic awareness rates of breast cancer symptoms and risk factors among rural women in Southwest China were at a low-medium level, with rates of 68.8% and 62.1%, respectively. This is similar to research results in eastern China. The lack of understanding of female breast cancer is mainly reflected in two aspects: symptom knowledge and risk factors.¹⁰ Studies in Palestine and Egypt also reported low levels of breast cancer knowledge among women,^{25,26} indicating that women's knowledge of breast cancer-related health is often fragmented and incomplete across different countries.

In accordance with the findings of previous studies,^{10,11,19} multivariate regression analysis in this study identified several factors that influenced the level of breast cancer awareness among rural women in Southwest. Education level, breast disease history, and contraceptive use were found to be significant factors.

Education level was consistently associated with the awareness level of breast cancer symptoms, risk factors, and overall breast cancer knowledge. The awareness level increased with higher education levels, which is consistent with the

results of studies conducted in Eastern and Northern China and Turkey.^{27,28} Therefore, it is important to provide more public health education targeting women with lower levels of education.

The history of breast disease was found to be a positive factor for women's participation in screening. These women had a significantly higher level of awareness of breast cancer, and pay more attention to the symptoms and risk factors of breast cancer. We believe that women with a history of breast disease often receive more health education in the process of medical treatment, so as to have a good performance in the understanding of breast cancer. However, this influencing factor has not been widely reported in previous studies.

Interestingly, this study found that women using IUDs had significantly lower levels of breast cancer awareness and knowledge of risk factors compared to women using other contraceptives. In China, IUD placement has been a dominant contraceptive method, especially among women in rural areas.²⁹ The choice of contraceptive methods may be related to women's living environment, education level, age, and fertility plans.³⁰ We speculate that may be the reason why women who use IUDs are associated with poor breast cancer awareness, but further research is needed to explore the association between different contraceptive methods and breast cancer perceptions. The study indicated that women under the menarche age of 12 had a greater awareness rate of breast cancer than women in other menarche age groups, which might be due to the higher education level of this participant group (data not shown). However, the regression analysis did not reveal any statistical significance between the age at menarche and the cognitive level of breast cancer.

Overall, the level of breast cancer awareness among rural women in Southwest was found to be relatively low, particularly regarding knowledge of risk factors and symptom identification. These findings can inform the development of targeted healthcare policies and strengthen health education programs to improve breast cancer awareness and knowledge among rural women.

Limitations

There are several limitations that should be acknowledged. Firstly, this study is a cross-sectional study, which limits the ability to establish causal relationships between breast cancer awareness and the factors examined. Future prospective studies are needed to further investigate these associations. Additionally, the study population consisted of middle-aged women from rural in Southwest China who voluntarily participated in free breast cancer screening. Therefore, the generalizability of the findings to a broader population may be limited.

Conclusion

Breast cancer awareness, particularly regarding knowledge of risk factors and early disease symptoms, was found to be poor among rural women. Efforts should be made to improve women's knowledge of breast cancer and promote early screening and detection, especially among the specific population in rural areas. Targeted health education programs are crucial in achieving these goals.

Ethics Approval and Consent of Participants

This study was conducted in accordance with the Declaration of Helsinki. It was an observational study involving rural women without any assignment or intervention. The study received approval from the National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College. All participants provided informed consent by signing an informed consent form.

Author Contributions

All authors have made significant contributions to the work, including conception, study design, data acquisition, analysis and interpretation. They have also been involved in drafting, revising, and critically reviewing the article. All authors have given final approval of the version to be published and have agreed on the journal to which the article has been submitted. They also agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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