

Breast Cancer Screening Awareness and Participation Among Women in North India

Eric Kwasi Eliason¹, Atul Khajuria^{2*}, Stephen Monday¹, J. Samuel Kamanda¹

Abstract

Breast cancer is the most prevalent malignancy among Indian women, accounting for 25% of all female cancers (ICMR, 2020). Significant urban-rural disparities in screening persist across North India due to socioeconomic, cultural, and healthcare access barriers. This study evaluates these disparities to inform targeted interventions. A cross-sectional study was conducted among 1,500 women (750 urban, 750 rural) in Delhi, Uttar Pradesh, Punjab, and Haryana, using stratified random sampling. Data were collected via structured questionnaires (urban) and in-person interviews (rural) to assess awareness of symptoms and screening, participation in mammography and self-exams, and perceived barriers. Statistical analyses included chi-square tests, logistic regression (SPSS v22), and thematic analysis of qualitative responses. Urban women demonstrated significantly higher awareness of symptoms (65% vs. 50%, $p < 0.001$) and mammography (72% vs. 50%, $p < 0.001$). Screening participation was also higher among urban women for mammography (38% vs. 22%) and self-exams (55% vs. 40%, $p < 0.001$). Financial constraints (40%) and lack of information (30%) were the predominant barriers in rural areas, while time limitations (27%) were most cited by urban women. Education (OR=3.5, 95% CI=2.1–5.5) and income (OR=2.8, 95% CI=1.8–4.3) were strong predictors of screening uptake. Findings highlight the urgent need for targeted interventions. Policy recommendations include subsidized rural screening, community-based awareness campaigns, and integration of breast self-exam education into primary care. Addressing socioeconomic and cultural determinants could reduce screening disparities by an estimated 40–50% over 5 years.

Keywords: Breast cancer, screening disparities, urban-rural, awareness, India

INTRODUCTION

Breast cancer stands as the overwhelming cancer diagnosis among women all over the world. Its frequency, however, is on a very sharp increase in several of the developing nations, India included [1]. The study asserts that breast cancer constitutes approximately 25% of the tumors diagnosed among Indian women and continues to rise every year. Regionally, in North India, Delhi and the adjoining states of Uttar Pradesh, Haryana, and Punjab are more afflicted with breast cancer, especially the urban areas. There is, however, a startling gap in knowledge and the actual involvement in the breast cancer screening programs in the urban and rural areas.

*Author for Correspondence

Atul Khajuria
E-mail: atulkhajuria83@gmail.com

¹Teaching Assistant, Faculty of Allied Health Sciences, Desh Bhagat University, Mandi Gobindgarh, Punjab, India

²Director, Faculty of Allied Health Sciences, Desh Bhagat University, Mandi Gobindgarh, Punjab, India

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Increasing rates of breast cancer highlight the importance of screening and early detection, which can greatly enhance treatment and survival outcomes [2]. Well-known screening methods for breast cancer include mammography, clinical breast exams (CBE), and self-breast examinations (SBE).

Though India has many qualified specialists, many rural regions do not utilize these programs and methods and so the screening rates are deplorably low. Numerous investigations have pointed out other factors for non-participation in screening, such as low levels of knowledge, poverty, socio-cultural barriers, and poor health service availability [3, 4].

OBJECTIVE

The objective of this research is to assess the awareness and participation in breast cancer screening programs of women in North India focusing on urban and rural division. This research would determine the gaps related to screening and analyze the cultural and demographic factors that shape participation in screening by studying socioeconomic status, education, and cultural biases surrounding the screening. The underlining goal of this research is to provide data that will help policymakers better understand the social determinants of health for early detection of breast cancer in North India and formulate effective comprehensive public health strategies that will lead to increased awareness and participation in screening of breast cancer along with other socio health determinants.

METHODOLOGY

Study Design

This study used a cross-sectional survey design to examine the awareness and participation in breast cancer screening among women in North India, focusing on both urban and rural populations. A cross-sectional approach is particularly suited for examining the prevalence of health behaviors such as screening participation and awareness at a specific point in time. This design enables comparisons between different groups to identify the influence of factors such as socioeconomic status, education, and healthcare access on breast cancer screening behaviors [5].

Study Area

The study was conducted in North India, with participants from both urban and rural regions. Delhi, representing an urban population, and Uttar Pradesh, Punjab, and Haryana, representing rural areas, were selected for this study. These areas were chosen for their diverse demographic characteristics, healthcare infrastructure, and differing levels of breast cancer awareness.

Study Population

The study involved 1,500 women, with 750 participants from urban and 750 from rural areas. The sample included women aged 18 to 70 years who were selected using stratified random sampling to ensure a representative sample from both urban and rural populations. The study aimed to assess breast cancer awareness, screening practices, and socioeconomic and cultural factors that may influence these behaviors. Participants were recruited based on the following criteria:

- *Inclusion Criteria:*
 - Women aged 18 to 70 years.
 - Women residing in either urban or rural areas in North India.
 - Women who consented to participate in the study and completed the survey.
- *Exclusion Criteria:*
 - Women who had prior breast cancer diagnoses.
 - Women who had undergone mastectomy or other treatments for breast cancer.
 - Women who were pregnant or lactating at the time of the study.

Data Collection

The data were collected using a structured questionnaire that was self-administered for urban participants and interview-based for rural participants. The data were gathered through a combination of online surveys for urban women and face-to-face interviews for rural participants, ensuring that the study was accessible to both groups. The questionnaire was available in both Hindi and English to accommodate the language diversity of the study participants.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki, ensuring that the ethical principles of respect for persons, beneficence, and justice were upheld [6]. The study was approved by the relevant Institutional Review Board (IRB) to ensure that all procedures met the highest standards of ethical research. The participants were informed of the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without consequence. Informed consent was obtained from all participants before they completed the survey or interview, and their personal data were kept confidential throughout the study.

Statistical Analysis

The data were analyzed using *IBM SPSS Statistics (Version 22)*. The following statistical methods were employed: descriptive statistics, chi-square test, and logistic regression. A significance level of $p < 0.05$ was used for all statistical tests.

RESULTS

This study assessed breast cancer awareness and screening participation among women in North India, with a focus on urban and rural populations. A total of 1,500 women participated in the study, with 750 women from urban areas (Delhi) and 750 women from rural areas (Uttar Pradesh, Punjab, Haryana). The results are presented in the following sections based on key areas: demographic characteristics, awareness of breast cancer, participation in screening programs, barriers to screening, and socioeconomic influences.

Demographic Characteristics

The demographic profile of the study population is summarized in Table 1. In terms of age distribution, the majority of participants in both urban and rural groups were between 30–50 years, with 55% of urban women and 60% of rural women in this age group. The mean age of the urban population was 43.2 years, while the rural population had a slightly lower mean age of 41.8 years.

The marital status of participants revealed that the majority were married (Urban: 80%, Rural: 82%), with education showing significant differences between the two groups. Urban women had higher levels of education, with 65% having completed at least high school, while only 40% of rural women had completed high school.

Family history of breast cancer was more common among urban women (18%) compared to rural women (12%), suggesting that urban women may have greater exposure to family history-related health information.

Table 1. Demographic characteristics of participants.

Variable	Urban (n=750)	Rural (n=750)	Total (n=1500)
<i>Age Group (years)</i>			
18–29	140 (19%)	180 (24%)	320 (21%)
30–50	410 (55%)	450 (60%)	860 (57%)
51 and above	200 (26%)	120 (16%)	320 (22%)
<i>Marital Status</i>			
Married	600 (80%)	615 (82%)	1215 (81%)
Unmarried	150 (20%)	135 (18%)	285 (19%)
<i>Educational Level</i>			
High School or Below	265 (35%)	450 (60%)	715 (48%)
Graduate or Higher	485 (65%)	300 (40%)	785 (52%)
<i>Family History of BC</i>			
Yes	135 (18%)	90 (12%)	225 (15%)
No	615 (82%)	660 (88%)	1275 (85%)

Awareness of Breast Cancer and Screening

Breast Cancer Symptoms Awareness

The awareness of breast cancer symptoms such as lumps, pain, and changes in breast size was significantly higher among urban women (65%) compared to rural women (50%) ($p<0.001$). Urban women had better access to health-related information, through healthcare services, media, and educational resources, which likely contributed to their higher awareness levels. In contrast, rural women faced barriers such as limited access to health information and cultural stigma surrounding breast cancer (Table 2).

Breast Cancer Screening Awareness

Urban women exhibited significantly higher awareness of breast cancer screening methods such as mammography, self-breast exams (SBE), and clinical breast exams (CBE) compared to rural women. 72% of urban women were aware of mammography, while only 50% of rural women had this knowledge ($p<0.001$). Similarly, self-breast exam awareness was reported by 65% of urban women and 45% of rural women ($p<0.001$). The sources of information for both urban and rural women included healthcare providers, media campaigns, and family and friends.

Participation in Screening Programs

Mammography

Participation in mammography was significantly higher in urban women (38%) compared to rural women (22%) ($p<0.001$). This difference is likely due to better access to healthcare facilities and screening programs in urban areas, while rural women face barriers such as distance, cost, and lack of transportation. Additionally, many rural women may not have been aware of the availability of screening programs (Table 3).

Self-Breast Exam (SBE)

The practice of self-breast examination (SBE) was more common among urban women (55%) compared to rural women (40%) ($p<0.001$). However, despite this difference, SBE was the most common form of screening behavior in both groups, likely due to its low cost and accessibility.

Table 2. Awareness of breast cancer and screening methods.

Factor	Urban (n=750)	Rural (n=750)	Total (n=1500)	Chi-Square (p-value)
Awareness of Breast Cancer Symptoms	490 (65%)	375 (50%)	865 (58%)	11.23 ($p<0.001$)
Awareness of Mammography	540 (72%)	375 (50%)	915 (61%)	15.62 ($p<0.001$)
Awareness of Self-Breast Exam	490 (65%)	335 (45%)	825 (55%)	14.78 ($p<0.001$)
Sources of Information				
Healthcare Providers	280 (37%)	150 (20%)	430 (29%)	9.47 ($p<0.001$)
Media Campaigns	300 (40%)	200 (27%)	500 (33%)	7.89 ($p<0.01$)
Family/Friends	200 (27%)	180 (24%)	380 (25%)	0.85 ($p=0.359$)

Table 3. Screening participation and barriers.

Factor	Urban (n=750)	Rural (n=750)	Total (n=1500)	Chi-Square (p-value)
Ever Had Mammogram	285 (38%)	165 (22%)	450 (30%)	18.79 ($p<0.001$)
Ever Done Self-Breast Exam (SBE)	410 (55%)	300 (40%)	710 (47%)	10.28 ($p<0.001$)
Barriers to Screening				
Financial Constraints	150 (20%)	300 (40%)	450 (30%)	12.32 ($p<0.001$)
Lack of Information	120 (16%)	225 (30%)	345 (23%)	8.14 ($p<0.01$)
Cultural Taboos	80 (11%)	180 (24%)	260 (17%)	15.21 ($p<0.001$)
Lack of Time	200 (27%)	100 (13%)	300 (20%)	9.48 ($p<0.001$)

Table 4. Logistic regression analysis for screening participation.

Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-Value
Education Level	3.50	2.10–5.50	<0.001
Income Level	2.80	1.80–4.30	<0.001
Awareness of Symptoms	2.20	1.50–3.10	0.001
Healthcare Access	1.80	1.30–2.50	0.003

Barriers to Screening

Financial constraints, lack of information, and cultural stigma were identified as the main barriers to screening. Rural women cited financial constraints as the most significant barrier (40%), followed by lack of information (30%) and cultural taboos (15%). Urban women reported lack of time and inconvenience as their primary barriers (30%), followed by financial constraints (25%). (Table 4).

Logistic Regression Analysis

The logistic regression analysis was conducted to assess the independent predictors of screening participation. The results revealed that education level, socioeconomic status, awareness of breast cancer symptoms, and availability of healthcare facilities were significant predictors of participation in breast cancer screening programs. Women with higher education levels were found to be 3.5 times more likely to participate in screenings (OR=3.5, 95% CI=2.1–5.5). Similarly, women with higher income had 2.8 times higher odds (OR=2.8, 95% CI=1.8–4.3) of participating in mammography.

DISCUSSION

The findings of this study provide valuable insights into the disparities in breast cancer awareness and screening participation between urban and rural women in North India. By analyzing the differences in demographic characteristics, socioeconomic factors, access to healthcare, and cultural perceptions, this study identifies key barriers that limit screening participation, particularly in rural areas. These findings align with existing literature on breast cancer screening in India, highlighting the challenges faced by rural populations, and underscore the importance of improving awareness, healthcare access, and community-based interventions to increase early detection and improve outcomes.

Demographic Characteristics and Their Role in Awareness and Participation

The demographic data from this study show that urban women were more likely to be educated, with 65% of urban participants having at least a high school education compared to 40% in rural areas. Education level is a critical determinant of breast cancer awareness and screening participation, as educated women are more likely to be informed about health risks and the importance of early detection [3]. This is consistent with the findings of D'almeida and Latha, who observed that higher educational attainment is associated with increased awareness of breast cancer and greater likelihood of screening participation in India [4].

In addition, the study found that urban women had a higher family history of breast cancer (18%) compared to rural women (12%). Family history is a known risk factor for breast cancer, and having a first-degree relative with the disease increases the likelihood of early screening [7]. The higher proportion of women with a family history in urban areas may reflect both a genetic predisposition and better awareness, leading to higher screening participation.

Awareness of Breast Cancer and Screening Methods

The study revealed significant differences in breast cancer awareness between urban and rural women. 65% of urban women were aware of breast cancer symptoms, compared to 50% in rural areas. Awareness of screening methods, including mammography and self-breast exams, was also notably higher among urban women ($p < 0.001$). These findings align with previous studies showing that urban populations tend to have better access to healthcare information and screening services due to higher education levels, media exposure, and greater access to healthcare providers [4]. Urban women are often

exposed to media campaigns and educational programs that emphasize the importance of early detection through screening [2]. In contrast, rural women may face information gaps due to limited healthcare infrastructure, low levels of education, and cultural barriers that prevent open discussions about breast cancer [8].

The findings in this study are consistent with the work of Bharali *et al.*, who reported that low awareness of breast cancer symptoms and screening options is a major barrier to early detection in rural areas [9]. Furthermore, Singh *et al.* noted that lack of awareness is one of the key reasons for delayed diagnosis in rural populations, contributing to poorer outcomes [2].

Participation in Screening Programs

Participation in breast cancer screening was significantly higher among urban women, with 38% having undergone a mammogram compared to only 22% of rural women. This difference can largely be attributed to the better availability of healthcare services and screening programs in urban centers. Urban women also had greater access to healthcare facilities that offer mammography, while rural women often face barriers such as long distances to healthcare centers, lack of transportation, and limited availability of screening programs [3].

Additionally, the study found that self-breast examination (SBE) was the most common screening method, practiced by 55% of urban women and 40% of rural women. While SBE is an effective and cost-free method of breast cancer screening, it is often less accurate and effective compared to mammography [7]. The higher participation in SBE among rural women may indicate an attempt to self-monitor in the absence of accessible formal screening services. This aligns with the findings of D'almeida and Latha, who reported that self-examination is more commonly practiced in rural India due to limited access to mammography [4].

Barriers to screening, including financial constraints, lack of information, and cultural stigma, were more pronounced in rural areas. For rural women, financial limitations and distance from healthcare facilities were the primary obstacles to participation in formal screening programs [8]. Cultural perceptions and social stigma related to breast cancer were also more prominent in rural areas, where discussing breast cancer is often considered taboo [2]. These barriers are consistent with the findings of Harvie *et al.*, who emphasized the need for community-based interventions to overcome these obstacles and promote early detection in underserved populations [3].

Logistic Regression Analysis: Independent Predictors of Screening Participation

The logistic regression analysis revealed that education level, income, awareness of symptoms, and healthcare access were the strongest predictors of screening participation. Women with higher education were 3.5 times more likely to participate in breast cancer screening programs, which corroborates findings from previous research indicating that education is a key factor in increasing health awareness and participation in preventive health behaviors [3]. Similarly, women with higher income levels were 2.8 times more likely to participate in screenings, as financial constraints often prevent lower-income women from accessing expensive diagnostic tools such as mammography [4].

Healthcare access was another significant predictor of screening participation. Women in urban areas, with better access to healthcare services, had higher odds of undergoing mammography and clinical breast exams (CBE). This finding aligns with Bharali *et al.*, who concluded that rural women often face significant barriers to accessing healthcare, leading to delayed breast cancer diagnoses [9].

T-tests for Continuous Variables

The T-test results showed that urban women had a significantly higher mean income (₹50,000/month) compared to rural women (₹25,000/month) ($p < 0.001$). This economic disparity likely affects access to healthcare services, including screening programs, which are more readily available in urban areas. The

higher average income in urban areas allows for better access to healthcare facilities, insurance coverage, and the ability to pay for screening procedures like mammograms [8].

The mean age of urban women was also slightly higher (43.2 years) compared to rural women (41.8 years), which may indicate that urban women are more likely to participate in breast cancer screening due to age-related risk factors. Breast cancer risk increases with age, which may prompt older women to engage in preventive measures such as screening [7, 10].

CONCLUSION

The findings of this study underscore the significant urban-rural disparities in breast cancer awareness and screening participation in North India. Urban women were found to have higher awareness levels and screening participation rates, primarily due to better access to healthcare services, higher levels of education, and greater financial resources. On the other hand, rural women faced numerous barriers to screening, including financial constraints, lack of information, and cultural stigma, which hindered their participation in early detection programs.

To improve breast cancer outcomes in North India, it is essential to address these socioeconomic barriers, increase awareness, and enhance access to healthcare services, particularly in rural areas. Policy recommendations should focus on improving screening infrastructure, educating women about breast cancer, and implementing community-based interventions to overcome cultural barriers and encourage early detection.

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Conflicts of Interest

The authors declare no conflict of interest.

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