NON COMMUNICABLE DISEASES

Barriers to Breast Cancer Screening Tools in a Cohort of Urban Indian Women

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Keywords

Breast Neoplasms • Mass Screening • Early Detection of Cancer • Barriers

Summary

Introduction. *Breast cancer has the highest incidence and mortality rate in India. Early detection of Breast cancer has better survival chances and reduces treatment costs. Breast cancer screening involves Breast Self-Examination (BSE), Clinical Breast Examination (CBE), and Mammography. The highest burden of breast cancer has been observed in metropolitan cities. So it becomes crucial to assess breast cancer awareness and screening practices among urban women. Moreover, currently, there is a significant gap in the literature concerning the barriers that affect screening practices amongst Indian women.*
Methods. *We conducted a survey-based, cross-sectional study on urban Indian women living in Uttar Pradesh. Women for this study were selected based on predefined inclusion and exclusion criteria. The data were collected using a self-administered questionnaire which included the socio-demographic variables (address, age, occupation, education level, marital status) of the participants and cancer and cancer screening-related questions.*
Results. *612 urban women in Uttar Pradesh, India participated in our study. Most were married (96%) and unemployed (59%). Approximately 76% had received education at the high school level or higher, while only 19% had health insurance. The participants' ages ranged from 30 to 70 years, with a mean age of 41 years ± 8.25 years).*
Conclusions. *Our study revealed high breast cancer awareness among participants but disparities in screening awareness based on age, marital status, insurance, and education. Most women have a positive attitude towards breast cancer screening, recognizing its importance for early detection. This attitude can drive participation if barriers are addressed, including knowledge gaps, symptom ignorance, shyness, financial constraints, and a lack of female doctors.*

Introduction

Cancer remains the second leading cause of death worldwide, with the global cancer burden projected to reach 35 million cases by 2050, according to the latest estimates from the Global Cancer Observatory (GLOBOCAN) 2023 [1]. Among all cancers, breast cancer is the most commonly diagnosed malignancy and remains the leading cause of cancer-related deaths among women [2]. In India, breast cancer incidence has been steadily rising, now accounting for approximately 14.8% of all cancer cases and 12.3% of cancer-related deaths among women, as per the Indian Council of Medical Research (ICMR) report 2023 [2, 3]. Given the absence of well-defined modifiable risk factors, early detection, accurate diagnosis, and timely treatment initiation are crucial for improving survival rates [4].

To facilitate early detection, breast cancer screening primarily relies on mammography, which is the only internationally accepted modality for breast cancer screening. Mammography, an X-ray imaging technique, is considered the gold standard, with evidence demonstrating a 20-30% reduction in mortality among women aged 50 years and older who undergo regular screening [5, 6]. However, in resource-limited settings such as India, where access to mammography may be restricted, breast self-examination (BSE) and clinical breast examination (CBE) serve as adjunctive methods to enhance early detection efforts. BSE, a self-performed technique, and CBE, conducted by trained healthcare professionals, help improve breast cancer awareness and may facilitate earlier diagnosis, particularly in low-resource environments where mammography is not widely available [7].

In India, despite the integration of breast cancer screening into the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDC), participation remains alarmingly low [8]. More than 70% of breast cancer cases in India are diagnosed at an advanced stage, significantly reducing the chances of successful treatment [9]. Findings from the National Family Health Survey-5 (NFHS-5) further highlight this issue, revealing that fewer than 0.5% of women aged 30-49 have undergone a CBE [10, 11]. This lack of widespread screening underscores the urgent need to identify and address barriers to participation.

Multiple factors influence breast cancer screening rates, broadly categorized into personal, economic, and healthcare service-related barriers. Socioeconomic

status, education level, and family history of breast cancer play a critical role in determining whether a woman undergoes screening [12]. In many developing countries, the high mortality associated with breast cancer is largely attributed to inadequate screening programs, limited awareness, and restricted access to healthcare services [13].

Among these barriers, lack of awareness and education stands out as a key reason for poor screening uptake in India [14]. Addressing these challenges is essential for improving screening participation and enhancing early detection efforts. However, there remains a significant gap in the existing literature regarding the specific factors that influence screening behaviours among Indian women. To bridge this gap, this study aims to identify the barriers to breast cancer screening among urban women in India and explore the underlying reasons for these obstacles. By examining factors such as awareness, socioeconomic constraints, and demographic profile, this research seeks to provide insights that can inform targeted interventions to improve screening uptake and early detection efforts.

Methods

This survey-based, cross-sectional study was conducted on urban Indian women residing in Uttar Pradesh. Indian women living in urban areas who had no complaints of breast-related diseases at any stage of their lives were included in the study. Women who did not complete at least 70% of the questionnaire were excluded from the study. Participants were recruited using a population-based sampling strategy from healthcare facilities. The study population included women attendants accompanying patients to the healthcare facilities. Trained survey administrators informed potential participants about the study objectives and obtained written informed consent before administering the questionnaire.

Data was collected by administering a comprehensive self-designed, pre-validated, structured questionnaire through both offline and online methods. The questionnaire was validated by a pilot study on a small sample (n = 30) to assess clarity and reliability. Necessary modifications were made based on participant feedback before full-scale data collection. The questionnaire was also made available in the local language for the participants to choose from. It included socio-demographic variables (address, age, occupation, education level, marital status) of the participants, along with cancer screening-related questions (about Breast Self-Examination, Clinical Breast Examination, and Mammography). Women who had limited access to healthcare settings may have been underrepresented, which could have influenced the findings. After data collection, the data obtained were analyzed with the help of IBM SPSS (Statistical Package for the Social Sciences) Software Version 24 (USine).

Results

This cross-sectional study was conducted on 612 women. Among them, the majority were married (95.8%, n = 586) and unemployed (59.3%, n = 363). A significant proportion (76.3%, n = 467) had received education at the high school level or higher, and only 18.5% (n = 113) possessed health insurance. The mean age of participants was 41 ± 8.25 years, with the majority (49%, n = 300) in the 31-40 years age group.

A high proportion of women (94.3%, n = 577) were aware of breast cancer, but awareness of screening methods was lower (74.7%, n = 457). Knowledge of breast self-examination (BSE) was reported by 67.6% (n = 414), clinical breast examination (CBE) by 71.6% (n = 438), and mammography by 56.5% (n = 346). Awareness of breast cancer was significantly associated with age ($p = 0.043$, $r = -0.056$) and education level ($p = 0.002$, $r = -0.094$), emphasizing the role of educational interventions in enhancing knowledge and promoting early detection strategies. Awareness of breast cancer screening was influenced by age ($p = 0.034$, $r = -0.023$), marital status ($p = 0.037$, $r = 0.085$), insurance status ($p = 0.003$, $r = 0.122$), and education level ($p < 0.001$, $r = -0.175$), highlighting the need for targeted public health campaigns to reach underserved populations (Tab. I, Figs. 1, 2).

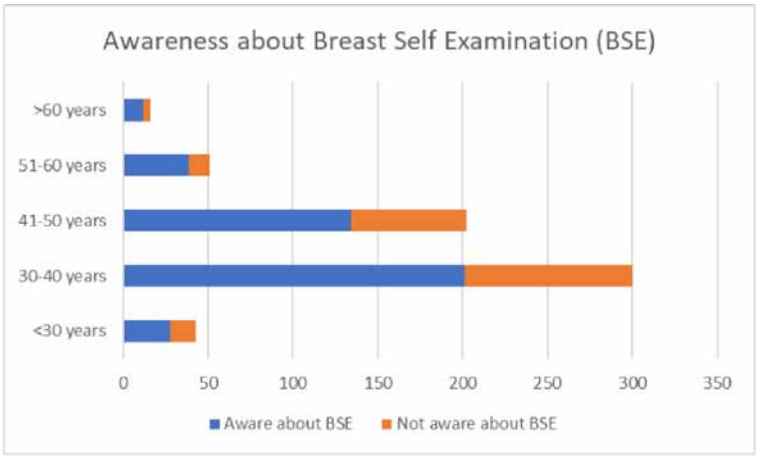
Despite the relatively high awareness of BSE (67.6%, n = 414), only 37.7% (n = 231) knew the correct technique, and even fewer (29.7%, n = 182) practiced it regularly. These screening behaviours and their demographic associations are detailed in Table II. Barriers to BSE included lack of knowledge (35%, n = 214) and the absence of symptoms (22.5%, n = 138). Of the women who performed regular BSE, 5.7% (n = 35) detected abnormalities, and only 4.7% (n = 29) sought medical consultation, indicating a gap between awareness and action that could delay the detection of potential malignancies (Tab. III). BSE awareness was influenced by occupation ($p = 0.020$, $r = 0.078$), insurance status ($p = 0.003$, $r = 0.122$), and education level ($p<0.000$, $r = -0.238$), while its practice was associated with marital status ($p = 0.021$, $r = 0.093$). These findings underscore the need for structured training programs to improve self-screening practices, which could enhance early cancer detection rates and reduce mortality.

Although 71.6% (n = 438) of women had knowledge of CBE and 65.2% (n = 399) believed in its efficacy, only 19.4% (n = 119) had ever undergone CBE, with a vast majority (80.6%, n = 493) never having been examined by a healthcare provider. This significant disparity between knowledge and practice suggests a lack of access or perceived necessity, which may contribute to late-stage breast cancer diagnoses. Preference for female healthcare workers (64.7%, n = 396) and specialists like breast surgeons (52.3%, n = 320) and gynecologists (30.9%, n = 189) suggests that increasing the availability of female providers could improve screening rates (Tab. IV). Awareness of CBE was significantly influenced by age ($p = 0.000$, $r = 0.104$), while the decision to undergo

Tab. I. Awareness about Breast Cancer Screening Techniques among urban Indian women.

Demographics	Awareness about BSE		P-value	Awareness about CBE		P-value	Awareness about Mammography		P-value
	Yes (n)	No (n)		Yes (n)	No (n)		Yes (n)	No (n)	
Age Group									
< 30 (43)	28	15	0.636	34	9	**<0.001**	31	12	**0.011**
30-40 (300)	201	99		229	71		162	138	
41-50 (202)	134	68		126	76		105	97	
51-60 (51)	39	12		42	9		37	14	
> 60 (16)	12	4		7	9		11	5	
Marital status									
Single (26)	22	4	0.084	15	11	0.121	13	13	0.492
Married (586)	392	194		423	163		333	253	
Occupation									
Employed (241)	176	65	**0.020**	169	72	0.794	144	97	0.419
Unemployed (363)	231	132		263	100		198	165	
Student (8)	7	1		6	2		4	4	
Insurance									
Yes (113)	90	23	**0.003**	83	30	0.646	71	42	0.135
No (499)	324	175		355	144		275	224	
Education Level									
Under class 10 (133)	71	62	**<0.001**	100	33	0.245	80	53	0.507
Class 10 (57)	26	31		36	21		26	31	
Class 12 (70)	49	21		53	17		38	32	
Undergraduate (158)	111	47		117	41		96	62	
Postgraduate (170)	137	33		112	58		94	76	
PHD (12)	11	1		10	2		6	6	
Illiterate (12)	9	3		10	2		6	6	

Fig. 1. Bar chart representing the awareness about breast self-examination (BSE) among various age groups.

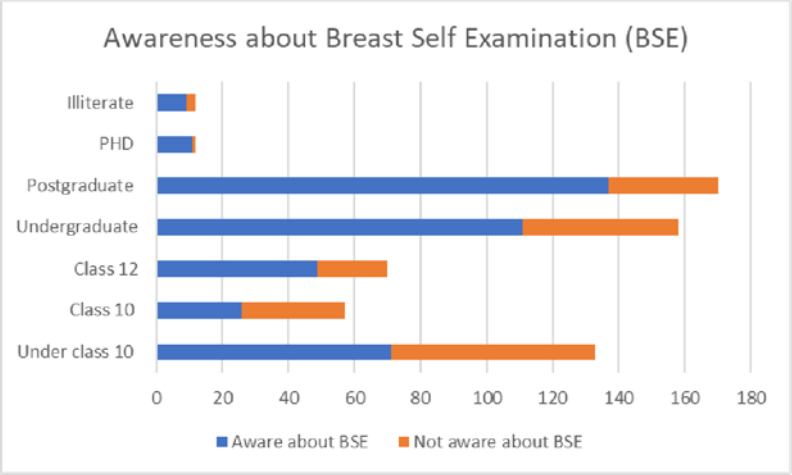


CBE was affected by occupation (p = 0.003, r = 0.127) and health insurance (p = 0.017, r = 0.096), reinforcing the need for affordable and accessible screening programs in both urban and rural settings (Tab. I).

Approximately 56.5% (n = 346) of the women were aware of mammography, with 52.5% (n = 321) believing it to be a valuable tool for early breast cancer detection. However, 89.1% (n = 545) women had never undergone screening mammography, and only 20 (3.3%) women reported recent screenings. This low utilization rate suggests significant barriers to access, affordability, or awareness that could contribute to delayed cancer diagnoses and poorer prognoses. Awareness of mammography (p = 0.011, r = -0.025) and its practice (p = 0.003, r = -0.069) were affected by age, with no significant association with marital status, occupation, insurance, or education level (Tab. I). These findings emphasize the need for policies promoting routine mammography screening, particularly for high-risk groups, to improve early detection and survival rates.

A significant portion of the women (73%, n = 446) felt that breast cancer screening was essential for early detection, while 47% (n = 290) believed it should be done only when necessary. A small percentage cited cultural

Fig. 2. Bar chart representing the awareness about breast self-examination (BSE) among various education groups.



Tab. II. Breast Cancer Screening practices among urban Indian women.

	BSE Practice		P-value	Underwent CBE		P-value	Underwent Mammography		P-value
	Yes (n)	No (n)		Yes (n)	No (n)		Yes (n)	No (n)	
Age Group									
< 30 (43)	9	34	0.168	6	37	0.850	5	38	**0.003**
30-40 (300)	86	214		58	242		28	272	
41-50 (202)	60	142		40	162		19	183	
51-60 (51)	22	29		12	39		14	37	
> 60 (16)	5	11		3	13		1	15	
Marital status									
Single (26)	13	13	**0.021**	4	22	0.593	1	25	0.344
Married (586)	169	417		115	471		66	520	
Occupation									
Employed (241)	78	163	0.413	63	178	**0.003**	33	208	0.158
Unemployed (363)	101	262		54	309		33	330	
Student (8)	3	5		2	6		1	7	
Insurance									
Yes (113)	41	72	0.110	31	82	**0.017**	14	99	0.617
No (499)	141	358		88	411		53	446	
Education Level									
Under class 10 (133)	27	106	0.056	17	116	0.078	13	120	0.877
Class 10 (57)	16	41		9	48		9	48	
Class 12 (70)	17	53		18	52		9	61	
Undergraduate (158)	50	108		32	126		16	142	
Postgraduate (170)	63	107		34	136		17	153	
PHD (12)	4	8		4	8		2	10	
Illiterate (12)	5	7		5	7		1	11	

(5%) or religious (3%) reasons against screening. Most women (83%, n = 510) were comfortable discussing breast cancer with a physician, while 88% (n = 539) did not feel embarrassed discussing it in society.

Inadequate knowledge about breast cancer and screening was perceived as the most significant barrier to clinical breast examination for 67% (n = 410) of women and mammography for 54.9% (n = 336). Additionally, ignorance of cancer-related symptoms was perceived as a barrier for both CBE and mammography for 67.3% (n = 412) and 54.6% (n = 334) of women, respectively. Shyness, hesitation, or embarrassment were perceived as barriers for 55.9% (n = 342) in CBE and 46.4% (n = 284) in mammography. Financial constraints were reported by 48.5% (n = 297) and 44.1% (n = 270) as barriers to CBE and mammography, respectively. Lack of female doctors in healthcare facilities was noted as a barrier by 41.8% (n = 256) for CBE and 37.3% (n = 228) for mammography.

It was determined that seeking healthcare professionals support was influenced by several factors, including fatalism (p = 0.021), financial constraints experienced by women (p = 0.008), time constraints (p = 0.007), transportation issues (p = 0.035), apprehension about

Tab. III. Breast Self-Examination (BSE) practices among urban Indian women.

Questions	Participants Response	
	n	%
Do you know how to perform BSE?		
Yes	231	37.7
No	183	29.9
Haven't heard about BSE.	198	32.4
How often do you perform BSE?		
Weekly	32	5.2
Monthly	41	6.7
Occasionally	90	14.7
Rarely	19	3.1
If you have been practising BSE, have you ever discovered any abnormality in your breast?		
Yes	35	5.7
No	147	24
If the answer to the question above is yes, what did you do?		
Consulted a doctor	29	4.7
Did nothing	6	1.0
If you've heard about BSE and still do not perform BSE, What is the reason?		
I don't know how to perform BSE	214	35.0
I don't have any symptoms of breast cancer	138	22.5
I believe that I can never have breast cancer	15	2.5
I am scared of being diagnosed with breast cancer	25	4.1
Doing BSE makes me worry about breast cancer	22	3.6
Doing BSE is embarrassing to me	13	2.1
I don't have enough privacy to do BSE	15	2.5
I don't believe in the efficacy of this test	12	2.0
I don't think I should touch my body like that again & again	22	3.6
BSE takes too much time.	17	2.8
BSE is unpleasant/ painful	10	1.6
I don't think BSE is important	12	2.0

Tab. IV. Clinical Breast Examination (CBE) practices among urban Indian women.

Questions	Participants Response	
	n	%
What centre would you like to visit for CBE?		
PHC	32	5.2
CHC	27	4.4
Any Government Hospital	318	**52**
Any Private Hospital	100	16.3
Anywhere	135	22.1
Gender preference of healthcare provider while undergoing CBE:		
Male	11	1.8
Female	396	**64.7**
Anyone	205	33.5
Which doctor would you prefer for CBE?		
General Physician	19	3.1
Breast Surgeon	320	**52.3**
Gynecologist	189	30.9
Anyone	84	13.7
Are you comfortable discussing breast cancer with a physician?		
Yes	510	**83.3**
No	102	16.7
Do you feel embarrassed talking about breast cancer in society?		
Yes	73	11.9
No	539	**88.1**
How do you feel about undergoing breast cancer screening?		
It is better for early detection	446	72.9
It should be done only when the need arises	290	47.4
It is culturally unacceptable	29	4.7
I have religious issues in doing so	17	2.8

diagnosis (p = 0.002), and fear of pain (p = 0.002) (Tab. V). Similarly, the study revealed that the utilization of screening mammography among women was influenced by factors such as time constraints (p = 0.025), anxiety related to potential diagnosis (p = 0.030), and concerns about the discomfort associated with the procedure (p = 0.004) (Tab. V). To improve participation rates, healthcare systems should focus on reducing wait times, ensuring patient comfort, and addressing anxiety through counseling and educational programs.

Discussion

The study found that the majority of respondents (94%) in our cohort exhibited familiarity with the concept of breast cancer, with approximately 75% of these women having awareness of breast cancer screening. Our findings deviate from those reported by Oswal et al. [15], wherein breast cancer awareness was documented at 50%, and awareness of breast cancer screening stood at 34%. Our study revealed that 68% of women were acquainted with breast self-examination (BSE), 72% were conversant with clinical breast examination (CBE), and 57% were informed about mammography. These results contrast with those obtained in a systematic review conducted by Taneja et al. [16], which documented knowledge levels of 41% for BSE, 51% for CBE, and 46% for mammography. Furthermore, the same review reported that 27% of women practiced regular BSE, a figure that closely mirrors our finding of 30% of participants regularly engaging in BSE. The higher awareness observed among our participants may be attributed to our study's exclusive focus on urban women, thereby excluding rural populations. These findings align with other studies from southern and western regions of India, where urban populations demonstrated higher awareness than their rural counterparts [19, 20]. However, the disparity in awareness levels across different regions suggests the need for region-specific strategies to improve breast cancer education.

A noteworthy revelation was that 35% of women

Tab. V. Barriers to Breast Cancer Screening experienced by urban Indian women.

Potential Barriers to Breast Cancer Screening	Underwent CBE			P-Value	Underwent Mammography			P-Value
	Yes (n)	No (n)	Total (n)		Yes (n)	No (n)	Total (n)	
Culture/traditions of the family	39	134	173	0.257	17	95	112	0.131
Ignorance of symptoms related to cancer	83	329	412	0.587	41	293	334	0.298
Fatalism	32	86	118	**0.021**	14	99	113	0.617
Traditional healers' (Ayurveda, Unani, Homeopathy, etc.) consultation	43	140	183	0.118	16	128	144	1.000
Shyness, Hesitant or Embarrassment / Reluctance to discuss such issues	75	267	342	0.100	39	245	284	0.051
No screening facilities in the area	48	165	213	0.165	22	169	191	0.781
No female doctor available	58	198	256	0.098	32	196	228	0.062
Inadequate knowledge regarding breast cancer & screening	82	328	410	0.665	38	298	336	0.796
Financial Problems	71	226	297	**0.008**	35	235	270	0.192
Lack of time or long waiting time for appointments	55	161	216	**0.007**	29	161	190	**0.025**
Geographic & Transportation Problem	39	115	154	**0.035**	20	129	149	0.291
Conservative society	30	112	142	0.628	10	95	105	0.732
Fear of diagnosis	50	134	184	**0.002**	22	114	136	**0.030**
Fear of pain	48	128	176	**0.002**	25	116	141	**0.004**
Negative past experiences (e.g. inappropriate services, bad behaviour, etc)	39	149	188	0.658	11	117	128	0.349
Language barrier	22	82	104	0.683	13	83	96	0.477

refrained from its practice due to a lack of proficiency in the technique. This underscores the need to develop breast cancer awareness initiatives with an intensified focus on educating individuals about BSE. This emphasis is justified by the unique nature of breast cancer, characterized by its occurrence in an externally observable organ, allowing for early-stage detection and treatment. Given the low-resource setting in many areas, community health workers could play a crucial role in BSE education through cost-effective, community-based training programs. Additionally, integrating BSE instruction into routine health check-ups or maternal health programs could ensure wider outreach.

Regrettably, our study unveiled that 81% of women admitted to never having undergone breast examination by a healthcare professional. Barriers such as shyness, hesitation, or embarrassment were cited by 56% in the context of CBE and 46% regarding mammography. Financial constraints constituted an impediment for 49% and 44% concerning CBE and mammography, respectively. Additionally, the absence of female healthcare providers within healthcare facilities was perceived as a barrier by 42% for CBE and 37% for mammography. Eliminating these hindrances could potentially amplify women's participation in CBE, as evidenced by the preference for government hospitals (52%) over private institutions (16%) for CBE. Furthermore, a substantial majority (65%) of women expressed a preference for female healthcare providers when undergoing CBE. To address these barriers in resource-limited settings, strategies such as subsidized screening programs, mobile screening units, and task-sharing with trained nurses could be explored. Ensuring the availability of female healthcare providers, particularly in public hospitals, could further encourage participation in CBE and mammography screening.

Our findings revealed that a striking 89% of women had never undergone screening mammography. This observation can be attributed to the economic constraints associated with mammography, rendering it less amenable to routine screening in a developing nation such as India [17]. Previous studies from similar developing countries, including Bangladesh and Pakistan, have also highlighted cost as a major impediment to mammography utilization [18]. This underscores the necessity of advocating for government-supported screening programs and insurance schemes that cover breast cancer screening to improve accessibility.

Interestingly, despite the participants' relatively high educational levels, 67% and 55% of respondents perceived "inadequate knowledge about breast cancer and screening" as the primary barrier to CBE and mammography, respectively. This finding corroborates

previous research by Aghadash et al. [19]. Other barriers, as perceived by the women in our study, encompassed ignorance of cancer-related symptoms, shyness, hesitation or embarrassment, and financial constraints.

Our study found an encouragingly high level of awareness about breast cancer among participants. However, disparities exist in awareness of breast cancer screening methods, with variations related to age, marital status, insurance, and education level. This suggests the need for targeted educational interventions to improve awareness among specific subgroups. Although awareness of BSE is relatively high, a concerning proportion of women who are aware of BSE do not practice it regularly due to a lack of knowledge about the proper technique and the absence of symptoms. These findings highlight the importance of not only raising awareness but also providing practical training and education on how to perform BSE correctly.

Similarly, awareness of CBE is high, but its utilization is low, with most women reporting never having undergone a clinical breast examination by a healthcare provider. This gap between awareness and utilization could be attributed to various factors, including preferences for specific healthcare facilities and providers. Efforts to promote mammography should focus on addressing these personal barriers.

Several barriers to breast cancer screening were identified, including inadequate knowledge, ignorance of symptoms, shyness, financial constraints, and the lack of female doctors in healthcare facilities. These findings underscore the multifaceted nature of the challenges that need to be addressed through targeted interventions such as educational campaigns, increased availability of female healthcare providers, and addressing financial barriers. Future research should explore the effectiveness of community-based breast cancer screening programs in low-resource settings, evaluate digital health interventions for awareness campaigns, and examine the impact of policy changes on screening participation rates. Additionally, longitudinal studies tracking women's participation in screening programs over time could provide deeper insights into behavioural trends and intervention efficacy.

Conclusion

Our research highlights both encouraging trends, such as high awareness and positive attitudes toward breast cancer screening, and concerning gaps, including low utilization rates and significant barriers. These findings provide valuable insights for policymakers to develop targeted strategies to improve screening rates and reduce the disease burden. Future research should explore context-specific interventions, such as mobile screening units, financial assistance models, and community outreach programs, particularly in rural areas. Increasing the availability of female healthcare providers and implementing educational campaigns for specific subgroups can further enhance screening uptake. Comparative studies between urban and rural populations will help identify tailored solutions to address healthcare access, cultural perceptions, and economic constraints.

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Ethical approval

The study was conducted only after approval by the Institutional Ethics Committee (IEC) of King George's Medical University, Lucknow (Reg No: XI-PGTSC-II B MBBS-S/P9), vide Letter: 869/Ethics/2022, dated: 04/08/2022. The details and data collected from the subjects were blinded, and confidentiality was maintained.

Conflict of interest statement

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Authors' contributions

The author contributions are as followed: VS: Conceptualization, Methodology, Investigation, Data curation, Writing- Original Draft. MS: Formal analysis, Writing-Review & Editing, Visualization, Literature review. GN: Supervision, Validation, Writing-Review & Editing. PS: Project administration, Resources, Supervision

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