

Critical Knowledge Gaps in Breast Cancer Awareness and Early Breast Cancer Detection among Nursing Professionals: A Cross-Sectional Survey Revealing the Need for an Innovative, Partner-Supported, Lifestyle-Integrated Strategy for Early Breast Cancer Screening—The Brahams Protocol

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ABSTRACT

Background: Breast cancer remains the most frequently diagnosed cancer and a leading cause of cancer-related mortality among women worldwide. Nursing professionals play a pivotal role in breast cancer awareness, patient education, and early diagnosis; however, baseline knowledge gaps within this workforce remain inadequately characterised. This study evaluated breast cancer awareness and early detection knowledge among nursing professionals and provides the scientific rationale for the Brahams Protocol (BP), a lifestyle-integrated, partner-supported, shared-responsibility complementary breast cancer screening modality.

Methods: A questionnaire-based cross-sectional survey was conducted among 273 nursing professionals from Sarvodaya Hospital, Faridabad, and Sarvodaya Hospital, Noida, between April and June 2026. Participants completed a structured anonymous questionnaire immediately before educational sessions. Twenty-one knowledge items covering general awareness, risk/protective factors, screening, and warning symptoms were analysed. Comparisons between female and male participants were performed using chi-square or Fisher's exact tests where appropriate.

Results: General breast cancer awareness was relatively satisfactory (60.2%), whereas knowledge of risk and protective factors was poor (19.2%). Awareness of mammography as a screening tool was high (96.7%), but none of the participants knew that routine mammographic screening is generally not recommended for average-risk women younger than 40 years or that WHO recommends breast self-awareness rather than breast self-examination. Only 2.2% practised breast self-examination, and no participant reported clinical breast examination or breast cancer screening. Significant sex-based differences were observed for several knowledge domains ($p < 0.05$).

Conclusions: Substantial evidence-based knowledge and behavioural gaps exist among nursing professionals despite satisfactory general awareness. These findings support the need for targeted educational interventions and provide the scientific rationale for prospective evaluation of the Brahams Protocol as a complementary breast cancer screening modality designed to strengthen continuous breast health vigilance, particularly in women younger than 40 years while complementing existing evidence-based screening pathways.

Keywords: Breast cancer; Breast cancer screening; Brahams Protocol; Nursing professionals; Breast awareness; Early detection; Cross-sectional survey.

INTRODUCTION

Global Burden of Breast Cancer

Breast cancer is the most frequently diagnosed cancer and remains one of the leading causes of cancer-related mortality among women worldwide, and is one of the most important public health challenges of the twenty-first century. Despite remarkable advances in imaging, surgery, systemic therapies, stage at diagnosis remains the single most important determinant of survival, with early-stage disease consistently associated with significantly better clinical outcomes than advanced breast cancer.¹

One of the greatest challenges in breast cancer control is the persistence of late-stage presentation. The World Health Organization (WHO) has consistently identified early diagnosis as one of the most effective strategies for reducing breast cancer mortality and improving survival. Nevertheless, a substantial proportion of women across countries with varying Human Development Index (HDI) continue to present with locally advanced or metastatic disease, reflecting persistent deficiencies in breast cancer awareness, timely recognition of suspicious breast abnormalities, and prompt healthcare-seeking behavior.²⁻⁴

Beyond Screening: The Continuing Importance of Breast Awareness

An equally important and increasingly recognized concern is the rising incidence of breast cancer among younger women. However, average-risk women below 40 years are not included in routine population-based mammographic screening programs recommended by the National Comprehensive Cancer Network (NCCN), the American Cancer Society (ACS), and other international professional organizations. Consequently, early diagnosis in younger women depends predominantly on breast cancer awareness, timely recognition of newly developing breast abnormalities, and prompt medical evaluation rather than organized screening alone.⁵⁻⁷

Nursing Professionals: A Critical Link in Breast Cancer Awareness and Early Diagnosis

Nursing professionals occupy a unique position within healthcare systems because they are directly involved in patient education, community awareness, health promotion, counselling, and preventive healthcare across the continuum of cancer care. Conversely, deficiencies in their knowledge may inadvertently compromise the effectiveness of breast cancer awareness initiatives.¹²⁻¹⁵

Persistent Knowledge Gaps: Evidence from Previous Studies

Previous cross-sectional studies conducted among nursing professionals and other healthcare workers in India and neighboring countries have consistently demonstrated important deficiencies in breast cancer knowledge despite participants' professional healthcare background. Deficits have been reported in understanding breast cancer risk and protective factors, warning symptoms, breast self-examination, mammography, and evidence-based screening recommendations, indicating that knowledge alone does not necessarily translate into sustained behavioral engagement, suggesting that existing awareness strategies have not fully addressed the behavioral and educational challenges required to facilitate earlier breast cancer diagnosis.¹²⁻¹⁵

Rationale for the Present Study

Although previous studies have evaluated selected aspects of breast cancer awareness among healthcare professionals, important knowledge gaps remain regarding fundamental concepts related to breast cancer and early diagnosis. Furthermore, many published reports have assessed awareness as a single composite outcome, providing limited insight into specific knowledge domains requiring targeted educational interventions. A focused evaluation of individual components of breast cancer awareness is therefore essential to better understand existing deficiencies and inform future strategies aimed at strengthening early diagnosis.^{2-7 12-15}

Study Objectives and Scientific Context

Accordingly, the primary objective of the present study was to evaluate breast cancer and early detection awareness among nursing professionals and to identify critical knowledge gaps that may influence patient education, community awareness, and preventive healthcare practices. The findings are intended to provide

evidence that may guide future educational initiatives and establish a scientific baseline for evaluating complementary behavioral approaches aimed at strengthening continuous breast health vigilance and facilitating earlier diagnosis of breast cancer, One such complementary strategy is the Brahams Protocol (BP).⁸⁻⁹

MATERIALS AND METHODS

Study Design and Setting

The survey was undertaken during eight structured educational seminars conducted at Sarvodaya Hospital, Faridabad, and Sarvodaya Hospital, Noida, between April and June 2026 and was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.¹¹ The survey was an anonymous, voluntary, non-interventional knowledge assessment that collected no clinical, identifiable, or personal health information and preceded any educational or protocol-related intervention; as such, it did not require formal institutional ethics committee approval. Participation was voluntary and anonymous, and completion of the questionnaire was taken to imply informed consent.

Study Participants

A total of 300 healthcare workers attended, of these, 273 participants voluntarily completed the survey questionnaire, yielding an overall response rate of 91.0%. Overall, 212 participants were female and 61 male, with an age range of 24–41 years.

Survey Instrument

A structured, self-administered questionnaire developed by the investigators was used for data collection.. The present study reports findings from Domain 1, which assessed Breast Cancer Awareness and Early Breast Cancer Detection Knowledge using 21 dichotomous (Yes/No) questions.

Data Collection

The questionnaire was administered before the commencement of each educational seminar to ensure that responses reflected participants' pre-existing knowledge and were not influenced by the educational intervention. Completed questionnaires were collected anonymously before the seminar began.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). Categorical variables are presented as frequencies and percentages. Comparisons between male and female participants were performed using the chi-square test ; Fisher's exact test was used instead where any expected cell frequency was below 5. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

273 nursing professionals completed the questionnaire, response rate of 91.0%, there were 212 females (77.7%) and 61 males (22.3%), age range of 24–41 years (Table 1).

Responses to the 21 breast cancer awareness and early detection questions are presented in Table 2. Overall awareness of the global and national burden of breast cancer was 82.8%, recognizing breast cancer as a major public health problem and 70.3% correctly identifying it as the most common cancer among women. However, awareness that breast cancer is the leading cause of cancer-related mortality among women (45.1%) and that its incidence is increasing among younger women (42.5%) was considerably lower. Female participants demonstrated significantly greater awareness than male participants for these variables (all $p < 0.001$) (Table 2).

Knowledge of established risk and protective factors was consistently poor. Only 23.8% recognized the protective role of early first pregnancy, 23.4% recognized the protective effect of breastfeeding, 13.9% identified delayed pregnancy as a risk factor, 12.8% recognized avoidance of breastfeeding as a risk factor, and 15.0% correctly identified that early-stage breast cancer is frequently asymptomatic. Significant sex-based differences were observed across all variables within this domain (Table 2).

Although awareness that screening is important for early breast cancer detection (70.7%), awareness of breast self-examination (91.6%), awareness of mammography as a screening modality (96.7%), and recognition that early detection improves survival (94.5%) were high. Only 38.1% knew the correct technique of breast self-examination, 2.2% reported practicing breast self-examination, and no participant (0.0%) reported having undergone clinical breast examination or breast cancer screening. Furthermore, none of the participants were aware that routine mammographic screening is generally not recommended for average-risk women younger than 40 years, or that the World Health Organization currently recommends breast self-awareness rather than routine breast self-examination (Table 2).

Recognition of nipple discharge as a potential warning symptom of breast cancer was also limited, with only 27.5% of participants identifying this correctly, and no statistically significant difference was observed between female and male participants ($p = 0.571$) (Table 2).

Domain-wise analysis demonstrated considerable variation in knowledge levels (Table 3). General breast cancer awareness achieved the highest overall knowledge score (60.2%), whereas knowledge regarding risk and protective factors was the lowest (19.2%), representing the largest knowledge deficit (80.8%). Knowledge of screening and early breast cancer detection was 39.4%, while recognition of warning symptoms was 27.5%, highlighting substantial deficiencies across multiple domains (Table 3).

Table 1. Baseline Demographic Characteristics of the Study Participants (n = 273)

Characteristic	Value
Total nursing professionals who attended awareness programs	300
Completed questionnaire	273
Response rate	91.0%
Female participants	212 (77.7%)
Male participants	61 (22.3%)
Age range (years)	24–41
Study design	Hospital-based, questionnaire-based, cross-sectional observational survey
Study period	April–June 2026
Study setting	Sarvodaya Hospital, Faridabad and Sarvodaya Hospital, Noida

Footnote: Values are presented as number (%) unless otherwise indicated.

Table 2. Breast Cancer and Early Detection Awareness Among Nursing Professionals According to Sex (n = 273)

Variable	Overall n (%)	Female n (%)	Male n (%)	p-value
Breast cancer is a major health problem	226 (82.8)	192 (90.6)	34 (55.7)	<0.001
Breast cancer is the most common cancer among women	192 (70.3)	183 (86.3)	9 (14.8)	<0.001
Breast cancer is a leading cause of cancer-related mortality	123 (45.1)	117 (55.2)	6 (9.8)	<0.001
Increasing incidence among younger women	116 (42.5)	109 (51.4)	7 (11.5)	<0.001
Early first pregnancy is protective	65 (23.8)	60 (28.3)	5 (8.2)	0.001
Breastfeeding is protective	64 (23.4)	59 (27.8)	5 (8.2)	0.001
Delayed pregnancy increases breast cancer risk	38 (13.9)	36 (17.0)	2 (3.3)	0.007
Avoidance of breastfeeding increases breast cancer risk	35 (12.8)	34 (16.0)	1 (1.6)	0.003
Early breast cancer may be asymptomatic	41 (15.0)	40 (18.9)	1 (1.6)	<0.001
Most breast cancers in India present at an advanced stage	71 (26.0)	66 (31.1)	5 (8.2)	<0.001
Screening facilitates early detection	193 (70.7)	172 (81.1)	21 (34.4)	<0.001
Mammography is a breast cancer screening test	264 (96.7)	205 (96.7)	59 (96.7)	1.000
Aware of breast self-examination (BSE)	250 (91.6)	200 (94.3)	50 (82.0)	0.008
Correct BSE technique known	104 (38.1)	93 (43.9)	11 (18.0)	<0.001
Regularly performs BSE	6 (2.2)	6 (2.8)	0 (0.0)	0.341 ^a
Early detection improves survival	258 (94.5)	201 (94.8)	57 (93.4)	0.533
WHO currently recommends breast self-awareness	0 (0.0)	0 (0.0)	0 (0.0)	— ^b
Routine mammography not recommended for average-risk women <40 years	0 (0.0)	0 (0.0)	0 (0.0)	— ^b
Ever underwent Clinical Breast Examination	0 (0.0)	0 (0.0)	0 (0.0)	— ^b
Ever underwent breast cancer screening	0 (0.0)	0 (0.0)	0 (0.0)	— ^b
Nipple discharge may indicate breast cancer	75 (27.5)	56 (26.4)	19 (31.1)	0.571

^a Fisher's exact test was applied.

^b Statistical comparison was not performed because no affirmative responses were recorded in either group. Values are presented as number (%). Chi-square test with Yates' continuity correction was used unless otherwise specified.

Table 3. Domain-wise Knowledge Scores Among Nursing Professionals

Knowledge Domain	No. of Questions	Knowledge Score (%)	Knowledge Gap (%)
General Breast Cancer Awareness	4	60.2	39.8
Breast Cancer Risk & Protective Factors	6	19.2	80.8
Screening & Early Detection	10	39.4	60.6
Recognition of Warning Symptoms	1	27.5	72.5

Footnote: Knowledge Gap = 100 – Knowledge Score.

DISCUSSION

Principal Findings

This **pre-planned domain-specific analysis** of a prospectively designed multi-domain cross-sectional survey identified important deficiencies in **breast cancer and early detection awareness** among nursing professionals. A marked disconnect between awareness and practice was evident, with virtually no participant reporting breast cancer screening or clinical breast examination. These findings indicate that important knowledge gaps continue to exist even among healthcare professionals.

Our findings are consistent with previous studies reporting persistent gaps in breast cancer knowledge among healthcare professionals despite educational initiatives.^{12–15} However, unlike earlier reports, the present study provides a **domain-specific assessment**, enabling precise identification of knowledge deficits that may inform targeted educational interventions and future behavioral research.

Knowledge of Breast Cancer Risk and Protective Factors

The most striking finding of the present study was the limited understanding of established breast cancer risk and protective factors. This domain demonstrated the lowest knowledge score, indicating substantial deficiencies in recognizing reproductive and lifestyle-related factors known to influence breast cancer risk. These findings are consistent with previous studies.^{12–15}

Screening, Early Detection, and Preventive Practices

Participants demonstrated limited understanding of evidence-based screening concepts, including appropriate age-specific mammography recommendations and the current emphasis on **breast self-awareness** advocated by the WHO, and none had undergone clinical breast examination or breast cancer screening, highlighting a substantial gap between knowledge and personal health behavior.

These findings are consistent with previous studies reporting that awareness of breast cancer screening modalities does not necessarily translate into appropriate preventive practices.^{12–15}

Persistent Knowledge- Action Gaps: Comparison with Previous Studies

One of the most important observations of the present study was the marked disconnect between participants' theoretical knowledge and their personal preventive practices. The findings of the present study are consistent with previous cross-sectional surveys conducted among healthcare workers in India and neighboring countries (Table 4). Taranikanti et al. demonstrated inadequate knowledge of breast cancer risk factors and deficiencies in screening awareness among nurses in South India.¹² Akila et al. similarly reported knowledge and screening-practice gaps among nursing and paramedical workers despite their healthcare background.¹³ Choudhury et al. observed that fewer than half of nursing staff knew the recommended frequency of breast self-examination or

the guideline-recommended age for initiating mammography, with no significant difference between male and female nurses.¹⁴ Comparable findings were reported by Shrestha Simangainda et al. among nurses in Nepal, who demonstrated persistent deficiencies in recognizing established risk factors such as obesity and smoking.¹⁵ Collectively, these studies spanning more than a decade indicate that substantial knowledge gaps among healthcare workers remain remarkably consistent across different institutions and geographical regions.

These findings suggest that awareness alone is insufficient to promote sustained preventive behavior, as awareness of breast cancer and certain screening modalities was relatively high, but this knowledge was not reflected in evidence-based health behavior.

Why Do These Knowledge Gaps Persist?

Perhaps the most important question arising from the present study is not whether knowledge gaps exist, but why they continue to persist despite decades of awareness campaigns, educational programs and institutional training. Previous surveys have consistently identified similar deficiencies and almost uniformly recommended strengthening education.^{12–15} However, the persistence of nearly identical findings suggests that conventional educational approaches alone may be insufficient to produce sustained behavioral change.

Most existing initiatives largely follow an Episodic Breast Cancer Screening and Awareness Model, characterized by isolated seminars, awareness campaigns and periodic educational interventions. While these approaches may temporarily improve knowledge, they seldom provide continuous reinforcement or translate knowledge into routine preventive behavior. Although these approaches have substantially improved breast cancer awareness and early diagnosis, they depend largely on individuals retaining acquired knowledge and translating it into sustained preventive behavior. The persistent disparity between knowledge and practice observed in the present study, together with similar findings reported over more than a decade, suggests that conventional educational approaches alone may not consistently achieve long-term behavioral engagement.^{12–15}

Table 4. Comparison with Previous Cross-Sectional Studies of Breast Cancer Knowledge Among Healthcare Workers

Study (reference)	Country / setting	Population	Key finding
Taranikanti et al. ¹²	India (South)	Nurses	Knowledge of breast cancer risk factors was poor overall, with most items scoring below 50% correct.
Akila et al. ¹³	India (Mumbai)	130 nursing staff	Identified gaps in breast cancer knowledge, attitude, and screening practice among paramedical/nursing workers.
Choudhury et al. ¹⁴	India (Ahmedabad)	200 nursing staff (65% female)	Only 47.5% knew the correct frequency of BSE and 52.5% were aware of the recommended mammography starting age; no significant sex difference in knowledge.
Shrestha Simangainda et al. ¹⁵	Nepal (Pokhara)	235 nurses	Overall 64.7% correct responses; only about half recognised obesity and smoking as risk factors.
Present study	India (Faridabad/Noida)	273 healthcare workers (212 F, 61 M)	Marked deficiencies in risk/protective-factor knowledge (19.2%) and screening-guideline awareness; near-absence of personal or partner screening practice.

Public Health Implications and Future Directions

Despite substantial advances in breast cancer awareness programs and the widespread implementation of evidence-based screening recommendations, the findings of the present study demonstrate that important deficiencies in knowledge and preventive practices persist even among nursing professionals.

The present study provides an important scientific baseline for evaluating innovative behavioral approaches designed to strengthen breast health vigilance. One such approach is the **Brahams Protocol (BP)**, a lifestyle-integrated, partner-supported ecosystem that aims to reinforce continuous breast cancer awareness, promote familiarity with normal breast architecture through repeated observation and palpation, encourage timely healthcare escalation following recognition of suspicious changes, and complement existing breast cancer screening pathways. The present findings provide the epidemiological and educational rationale for prospective studies evaluating the feasibility, acceptability, implementation, and effectiveness of such complementary behavioral strategies.^{8,9}

How can this Knowledge – Action gap be bridged: Brahams Protocol (BP): The Conceptual Distinction Between the Current Screening Paradigm and the Brahams Protocol

The **Brahams Protocol (BP)** has been conceptualized as a **novel lifestyle-integrated breast cancer screening modality** that differs fundamentally from existing screening approaches in several respects, as a complement to existing breast cancer screening pathways.^{2–9}

First, unlike conventional screening programs, which are episodic and undertaken at guideline-defined intervals, BP is designed as a continuous lifestyle-integrated screening modality. Rather than limiting breast screening to periodic healthcare encounters, BP promotes repeated observation and structured palpation as part of routine life, encouraging continuous familiarity with normal breast architecture and facilitating recognition of newly developing interval changes.

A second distinguishing feature of BP is its partner-supported shared-responsibility model. Conventional screening and awareness recommendations are primarily centered on the individual woman. In contrast, BP introduces the concept of shared breast health responsibility, whereby both partners actively participate in structured breast screening. This integrates emotional reinforcement, mutual accountability, and sustained behavioral engagement, transforming breast health vigilance from an individual responsibility into a shared health practice. This represents a conceptual shift.

Third, existing screening programs are **healthcare system-driven**, requiring access to healthcare facilities, trained personnel, or imaging infrastructure. In contrast, BP is **individual and partner-driven**, enabling screening within the home environment without dependence on specialized equipment.

Fourth, conventional screening predominantly detects **already established structural abnormalities** at the time of examination. BP is based on the principle of **serial familiarity with normal breast architecture**, whereby repeated examination facilitates recognition of subtle interval changes as they develop, potentially prompting earlier clinical evaluation.

Fifth, current screening recommendations are generally **age and risk-stratified**. BP is intended to be **applicable across all adult age groups**, including younger women.

Sixth, most established screening strategies focus primarily on **abnormality detection**. BP additionally incorporates **behavioral reinforcement**, promoting continuous breast health awareness, regular participation, shared responsibility, and timely healthcare escalation following recognition of suspicious changes.

Bridging an Important Gap in Contemporary Breast Cancer Screening (Women less than 40 Years)

Current international guidelines generally do not recommend routine population-based mammographic screening for average-risk women younger than 40 years because of lower disease prevalence, increased breast

density, reduced diagnostic sensitivity, and the potential harms associated with unnecessary investigations and over diagnosis.^{2–7}

These recommendations, while evidence based, create an important **public health screening gap** for younger women. The BP has been conceptualized to address this important gap by providing a complementary, lifestyle-integrated breast cancer screening modality during the years in which organized population-based mammographic screening is generally unavailable.^{8,9} The potential significance of BP extends beyond younger women alone. Because BP is designed as a complementary screening modality that can coexist with established breast cancer screening programs.

Future Research Directions

The present study establishes an important scientific baseline for future research aimed at strengthening breast cancer awareness and facilitating earlier diagnosis. While conventional educational programs remain indispensable for improving knowledge, the persistent knowledge–practice gap observed in the present study, together with similar findings reported in previous literature, indicates that educational interventions alone may not be sufficient to achieve sustained behavioral change.^{12–15}

BP represents a complementary breast cancer screening modality. Built upon the principles of **continuous lifestyle integration, partner-supported shared responsibility, serial familiarization with normal breast architecture, repeated observation and palpation, recognition of interval breast changes, and timely healthcare escalation.**^{2–7}

Strengths and Limitations

The present study has several important strengths. To our knowledge, this is among the few studies to undertake a pre-planned domain-specific analysis of breast cancer and early detection awareness derived from a prospectively designed multi-domain survey among nursing professionals. Furthermore, the domain-specific analytical approach permitted detailed identification of educational deficiencies that may not be apparent when awareness is reported as a single composite measure. These findings provide a contemporary scientific baseline for designing targeted educational interventions and for evaluating complementary breast cancer screening strategies in future prospective studies.

The study also has certain limitations. Its cross-sectional design precludes assessment of causal relationships between knowledge and preventive behavior, and the findings represent a single point in time. As the survey was conducted among nursing professionals from two tertiary care hospitals, the results may not be fully generalizable to other healthcare settings or the general population. Information was obtained through self-administered questionnaires and may therefore be subject to recall and response bias. Nevertheless, the study provides robust baseline evidence regarding breast cancer and early detection awareness among nursing professionals and identifies critical educational gaps that warrant targeted interventions and prospective evaluation.

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