

Research Article

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Bridging Knowledge Gaps in Self Breast Examination - a Simulation Based Learning Approach with Pre-Post Evaluation

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Abstract

Background: Breast cancer being the most common cancer in females needs early detection and management. Early detection of breast cancer is possible with screening modalities like Mammography (MMR), Clinical breast examination (CBE), and Self Breast Examination (SBE). SBEs are often the only method for early detection of breast cancer thereby making regular and periodic self breast examination more crucial. Objective: to evaluate simulation based self breast examination training program in non medical staff of an educational complex.

Method: This was a cross sectional study which included 90 participants. Breast simulators and full body manikin used. Teaching session included lecture demonstration and hands on practice followed by assessment. Results: Only 33.3% females were aware of self breast examination and only 22.2% had performed it before. It was observed that there were statistically significant increase in knowledge score in post test after intervention as compared to pretest knowledge ($p < 0.001$) At the end of the session, proper inspection, palpation, lump identification, axillary region palpation and differentiation between soft and hard lumps was done by 95.6%, 91.1, 92.2, 88.9 and 71.1 respectively.

Discussion: Very few women are well versed with self breast examination and one of the most effective ways of making women good at self breast examination is by teaching them on breast simulators.

Keywords: Self Breast Examination Checklist, Breast Simulator, Pre Post Test Evaluation, Self Breast Examination, Health Care Simulation

1. Background

Cancer is the leading cause of mortality worldwide. Breast cancer remains the most common cancer in females. From 1980 to 2000, rates of invasive breast cancer increased by nearly 40% among women ages 50 and older and increase of 15% among younger women [1]. The Indian scenario is similar, new breast cancer accounts for 26.6% of all cancer cases and 10.7% of all deaths in women [2]. Early detection and rapid treatment is the key for management of all cancers and breast cancer is no exception.

Early detection of breast cancer is possible with screening modalities like Mammography (MMR), Clinical breast

examination (CBE), and Self Breast Examination (SBE). In less developed countries, access to imaging and CBEs is not readily available and hence SBEs are often the only method for early detection of breast cancer thereby making regular and periodic self breast examination more crucial [3]. The American College of Obstetricians and Gynaecologists (ACOG) refers to this as breast self-awareness. A person who is familiar with the features of their own breasts has a better chance of spotting any changes that do occur, and this can increase the likelihood of early detection and effective treatment. A breast self-exam helps to understand the normal look and feel of breasts. If the female notices any change in her breasts that seem abnormal, she can consult their doctor. All

said and done, Self Breast Examination is not without its inherent drawbacks. The main problems arise due to false positive results coming out of examinations done by the patients themselves. These problems result in increased benign lesion identification, unnecessary imaging, biopsies, and anxiety provoked by a possible cancer diagnosis [4].

In fact, review article by Kösters JP, Gøtzsche PC states that data from two large trials do not suggest a beneficial effect of screening by breast self-examination whereas there is evidence for harms [5]. This can be due to knowledge and practice of breast self-examination being inadequate among women in the general population [6,7]. The high number of false positive results could indicate a deficiency in proper training and understanding of SBEs in the general population.

These studies highlight the need for an objective method of teaching the correct examination technique to the general population. The technique should be independently assessable, easily repeatable and the findings should be reproducible. This will help in reducing the number of false positive cases with SBE and thus reduce its main drawbacks. Simulation labs are now being set up in medical colleges across the country for the same. This provides us with a readily accessible and acceptable resource for the population to practice their SBE skills. Training on the simulators provides a real hands-on experience that will ease the process of acquiring proper knowledge of SBE [8]. Keeping this in mind, this study was planned to assess knowledge about breast cancer in the general population and to evaluate effectiveness of a simulation based self breast examination training program in non-medical staff of an educational complex. It was done with questionnaire and practical assessment.

2. Methods

It was a cross sectional interventional study conducted after the approval of ethics committee. Study population consist of 90 females.

Sample size calculation: A research article⁶ indicates that, P value=0.16, confidence level set $(1-\alpha)=0.95$ and Z value associated with confidence=1.96, absolute precision=0.08.

Using the formula $n = \frac{[Z]^2 \{P(1-P)\}}{d^2}$ Sample size $n=81$.

To account for potential dropouts and incomplete responses, 90 female participants were ultimately included in the study.

Inclusion criteria – Females in the age group of 18-60 years who are working as non-medical staff of the educational institution.

Exclusion criteria – 1. Females who had breast pain or those who were already diagnosed with breast cancer

2. Those females who had any prior exposure to SBE programmes or training in the same. Informed consent was obtained from all the participants.

A pilot study (pre-test only) was conducted on 10% of participants and to avoid bias these participants were not included in the study.

The tool was finalised based on their feedback. They were taught about the self-breast examination, its importance and about breast malignancy in brief. The training was carried out in the simulation lab of a medical college. The training session consisted of a lecture and demonstration on the breast simulators. All the participants got hands-on experience. They were taught to inspect and palpate the

manikins with and without lumps. Then they were trained to differentiate between hard and soft lumps. The entire duration of training was two hours. Pretest was administered before the session. There were 15 questions of one mark each to assess knowledge. It was google form test. Post test with same questions, administered immediately after the session and 15 days after the session to check for retention of knowledge.

The practical skills of participants in performing breast self-examination (BSE) were assessed using a structured checklist on a breast manikin. The assessment was conducted after the training session. The checklist included key steps of inspection and palpation, ensuring coverage of all breast regions, and the ability to identify a simulated breast lump. Statistical analysis The data obtained from the study tools were categorized, tabulated, analyzed, and data entry was performed using the SPSS software 29. Descriptive statistics frequency, and percentage were used to summarize the data. To assess the difference between pre-test and post-test scores, a paired t-test was applied. A p-value of <0.05 was considered statistically significant.

3. Results

The study targeted non-medical staff of an educational institute, and a total of 90 female participants were included. The results of the statistical analysis are presented in three main sections. The first section describes the baseline characteristics of the participants. The second section presents the assessment of knowledge related to breast self-examination (BSE), including past experience and awareness. The third section provides a comparison of knowledge and practical proficiency in performing BSE before and after the intervention.

4. Discussion

Our study included 90 female nonmedical staff currently working in an educational complex in Pune city. The basic aim was to educate them about breast cancer and teach them about self breast examination which helps in early detection of abnormalities of the breast and in case of malignancies helps in timely treatment and cure.

The ages of participants ranged from 20 to 60 years, with the majority of respondents falling within the 31-40 year age group 90 (54.4%) as in table 1. The mean age of the participants was 37.4 ± 7.9 years. The predominance of participants within this age range underscores their importance in understanding specific socio-economic and mental health patterns.

Age	No of Participants	Percentage [%]
21 to 30	15	16.6
31 to 40	49	54.4
41 to 50	20	22.2
51 to 60	6	6.8
Total	90	100

Table 1: Age Wise Distribution in Study Population

Table 1 Shows Maximum Population is Between 31 to 40 Years
Table 2 highlights that a significant majority of female participants 90 (56.7%) were graduates, while fewer were postgraduates. This

educational distribution is indicative of a relatively well-educated sample. Individuals with more education tend to have greater access to resources and social networks.

Education	No of Participants	Percentage[%]
Undergraduate	6	6.7
Graduate	51	56.7
Postgraduate	31	34.4
Other	2	2.2
Total	90	100

Table 2: Education Distribution of Study Population

Table 2 Shows That Maximum Females in the Study Population are Graduates

The findings from Table 3 provide important insights into the participants' family history of breast cancer and their awareness of breast health practices. The majority of participants 90 (97.8%) reported not having a family history of breast cancer. Similarly, 90 (96.6%) of participants did not have a history of breast lumps. Other studies that show individuals with no direct family history

of breast cancer may underestimate their risk and therefore fail to adopt preventive behaviors [9]. Interestingly, despite the lack of a familial or personal history of breast cancer or lumps, a significant proportion of these participants expressed a strong interest in learning more about breast cancer and self-breast examination (SBE).

Particular	Yes/No	No of Participants	Percentage [%]
Family History of Breast Cancer	Yes	2	2.2
	No	88	97.8
History of Breast Lumps	Yes	4	4.4
	No	86	95.6

Table 3: History of Breast Cancer

Table 3 Shows That Maximum Population Has No History of Breast Cancer in the Family and Maximum Population has No History of Lumps in the Breast

People with a familial history of breast cancer are often more aware of and proactive about self-breast examination. Studies have shown that lifestyle factors, hormonal influences, and environmental exposures can also contribute to the development of breast cancer, regardless of family history [10]. Therefore, even those without a

familial predisposition should be educated about the importance of regular self-breast examinations. It was seen that only few females 90 [33.3%] were aware of self-breast examination and Out of these only 90 (22.2%) had performed it before [Table 4].

Particular	Yes/No	No of Participants	Percentage [%]
Heard of SELF BREAST EXAMINATION before			
	Yes	30	33.3
	No	60	66.7
Performed SBE before		90	100
	Yes	20	22.2
	No	70	77.8

Table 4: Pre Existing Awareness About SBE and Past Experience of Performing SBE

Table 4 Shows That Majority of the Population did not know About Sbe and Most of Them had Not Performed Sbe Before

H Kumarasamy stressed the same point that the level of knowledge and practice of BSE among females were unacceptably low. He concluded that efforts should be made to increase level of knowledge and practice of BSE through health education programs [11]. According to Bapat, R.S, the awareness regarding BSE are good the practice rates are still low [12]. Roy Philippines also stressed about planned integrated-educational programs to promote BSE for early detection and management of breast cancer [13]. Breast self-examination (BSE) is an ideal method which can be done by every woman at her leisure time with little training. Medical and paramedical professionals can act as trend setters in promoting BSE for control of breast cancer in the community [14,15].

The results of the pretest and post tests were compared to reach to a conclusion. As there was not much of a difference in the results of post test 1 and 2 the results of post test 2 are taken into consideration. It was observed that there were statistically significant increase in knowledge score in post test after intervention as compared to pretest knowledge ($p < 0.001$). The study by Moussa concluded that training nursing students in BSE has a positive impact on their knowledge [16]. Same observation by Shoushtari Elaheh [17]. Self-breast examination is extremely useful in detection of lumps.

The results of this study highlight the effectiveness of simulator-based training in enhancing the competency of individuals performing self-breast examinations (SBE). A hands-on assessment revealed that 90 (88.9%) of participants were able to accurately demonstrate the steps involved in the inspection process, and an even higher percentage-91.9%-correctly executed the steps of palpation. These findings suggest a high level of skill acquisition following training, reflecting the value of practical, simulation-based learning in medical education and public health awareness programs.

Furthermore, the tactile aspect of the examination was well understood and executed by the majority, with 90 (92.2%) performing palpation correctly and successfully identifying simulated lumps. This is particularly important given that early detection of breast lumps can significantly impact prognosis and treatment outcomes. The inclusion of axillary examination, often overlooked in routine self-exams, was performed by 90 (88.9%)

of participants, indicating an encouraging level of thoroughness in the training. Since palpation of the axillary region is essential for detecting lymph node involvement, this high rate of compliance suggests a comprehensive understanding of the complete SBE process.

Overall, these results underscore the value of simulator-based education in improving both the knowledge and the practical skills required for effective self-breast examination. Such training can empower individuals with the confidence and competence to conduct regular self-assessments, which may contribute to earlier detection of breast abnormalities and better health outcomes. Continued reinforcement and periodic retraining could further sustain these skills and potentially increase early breast cancer detection rates in the broader population. The practical education using a breast model improves the knowledge and the technologies regarding the breast self-examination. V L Champion concluded that the intervention consisting of information, BSE demonstration, and follow-up demonstration significantly increased logged frequency, logged proficiency, observed proficiency, and nodule detection one year postintervention. The group receiving both the belief intervention and information intervention demonstrated the highest nodule detection [18]. Differentiating between hard and soft lumps is a little bit difficult on simulators as compared to the normal breast, yet 90(71.1%) of the females were able to differentiate them on palpation correctly.

The current research by Bhuvaneswari G.S, Rashika J and Cathrin evaluated whether a capacity-building program using video assisted teaching and self-breast examination demonstration performed by researcher to simulator. They stated that it was a more effective way to create the awareness on breast self-examination [19]. Just showing presentations or giving useful material to read isn't enough for the females to learn properly. Many women are too shy to voice their needs about learning self-breast examination as it is a taboo in India. Hence teaching and learning is much easier on simulators as they resemble the human breast in many ways. The texture too is very close to the actual breast and if the women could identify and differentiate lumps in these simulators, they would definitely be able to do it on their own breast. And hence simulators are of great help to teach self-breast examination to general public.

5. Limitations

Limitations of this study are, the total number of participants was relatively small, which may limit the statistical power and the

ability to detect subtle effects or differences and the evaluation focused on immediate outcomes following the simulation-based training. Long-term retention of skills could not be tested.

	N	Mean	SD	P - value
Pretest score	94	5.35	2.10	<0.001
Posttest score	94	10.06	1.73	

Table 5: Comparison of Knowledge Score in Pretest and Posttest

Table 5 It was Observed that There Were Statistically Significant Increase in Knowledge Score in Post Test After Intervention as Compared to Ptest Knowledge (P<0.001)

STEPS OF SBE	Correctly done [%]	Not done [%]	Total [%]
Steps of inspection on self	88.9	11.1	100
Inspection on simulator	95.6	4.4	100
Steps of palpation on self	91.1	8.9	100

Table 6: Practical Aspect of Performing SBE on Simulators

Table 6 Shows That Majority of the Females Were able to Perform Self-Breast Examination Properly After the Study

Human Ethics and Consent to Participate declarations – obtained from all participants The ethics declaration is done in accordance with the Declaration of Helsinki”

Name of the Approval Committee: INSTITUTIONAL ETHICS COMMITTEE (DHR Reg. No: EC/NEW/INST/2022/MH/0150)

Funding Declaration : ICMR STS 2023 - REFERENCE ID 2023-04015 Ethical approval letter attached.

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