

Assessment of Awareness About Breast Cancer Among Students of an Engineering College in Kanchipuram, Tamil Nadu - A Cross-Sectional Study

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Abstract

Background: It is feasible to reduce breast cancer mortality in women under 70 by 25% by 2030 and 40% by 2040 through an annual global reduction of 2.5 percent. Key strategies for achieving these targets include early detection, timely diagnosis, and comprehensive management of breast cancer, prompting an investigation into the awareness levels among female engineering students in Trichy.

Methodology: An observational cross-sectional study involving 421 female students from an engineering college in Trichy, Tamil Nadu, was conducted using probability proportionate to size sampling. Data were collected via a self-administered questionnaire, adapted from the Breast Cancer Awareness Measure (Breast CAM) version 2, utilizing Google Forms.

Results: The sample predominantly comprised third-year students (N=144) and unmarried individuals (N=388). Despite a significant number of participants recognizing breast cancer warning signs (58.6%) and risk factors (99.2%), only a small fraction (4.7%) demonstrated an adequate level of confidence and skill in early detection.

Conclusion: Out of 413 responses, a majority of women identified breast cancer risk factors and symptoms; however, the overall awareness level among this educated demographic remains inadequate. Current trends suggest that Indian women are increasingly affected by the disease at a younger age.

Keywords: Breast self-examination, warning signs, risk factors

Introduction

Breast, colorectal, lung, cervical, and thyroid malignancies represent the most prevalent forms of cancer among women [1]. Breast cancer can impact females globally post-puberty, with incidence rates escalating with age [2]. About 50% of breast cancer cases are diagnosed in women over 40, who have no additional identified risk factors apart from gender [3]. In countries with advanced healthcare infrastructures, survival rates for various cancer types are improving due to early diagnostic methods, effective therapies, and supportive care [4]. In 2020, breast cancer caused 685,000 women's deaths, while 2.3 million women received a cancer diagnosis worldwide [5]. By the end of 2020, breast cancer was the most frequently diagnosed cancer globally, with 7.8 million women diagnosed in the prior five years [6].

Breast cancer causes the greatest loss of disability-adjusted life years of any cancer type internationally [7].

A lack of knowledge regarding breast cancer discourages women from utilizing screening services and performing self-examinations [8]. Despite longstanding national programs aimed at enhancing awareness and promoting early detection, such as the National Cancer Control Program under NPCDCS initiated during the 12th five-year Plan (2012–2017) [9], breast cancer remains the leading cause of cancer mortality in the country [10]. Barriers including insufficient awareness, stigma, fear, and gender disparities contribute to elevated mortality rates and decreased participation in screening behaviours [11]. Although breast cancer is a primary contributor to cancer-related fatalities among Indian women, many remain oblivious to their condition [12]. Mitigating morbidity and mortality requires enhanced knowledge of signs and symptoms, as well as early detection through mammography, clinical breast examinations, or self-examinations [13]. Regrettably, few women engage in these practices to monitor their breast health [14].

This research evaluated the level of breast cancer awareness among engineering students in an urban context [15]. The study aimed to ascertain the extent of knowledge engineering students possess regarding breast cancer [16]. The objectives included examining their awareness, attitudes, and confidence in recognizing breast cancer symptoms, and the correlation between knowledge of breast cancer and its warning signs with their confidence, attitudes, and behaviors [17,18].

Materials and methods

A cohort of 421 female engineering students was recruited for this study. Informed consent was acquired from all participants. Participant privacy and confidentiality were strictly upheld. Data gathered was solely for research objectives. Methodologies utilized in this research have ethical approval from the Srinivasan Medical College Hospital and adhere to the Indian Council of Medical Research's ethical guidelines, consistent with the 1975 Helsinki Declaration as updated in 2000.

Female engineering students from Kanchipuram district were involved in this three-month cross-sectional study, encompassing one month for data collection, followed by analysis and discussion. A prior study in Iraq by Alwan et al. indicated that 57.4% of women conducted self-examinations, with a 95% confidence interval and a 5% margin of error. The minimum sample size was calculated to be $N=376$ using the Open Epi platform. With a 10% non-response rate accounted for, the sample size was adjusted to $N=421$. Systematic sampling was employed to select every alternate female participant based on probability proportionate to size. Participants were briefed on the study procedures and consent was obtained.

The study utilized the Modified Breast Cancer Awareness Measure [BCAM Version 2], covering areas such as warning signs, confidence, skills, behaviors, delays in medical assistance, healthcare barriers, and risk factors. The BCAM is acknowledged for its effectiveness in measuring women's awareness of breast cancer. Data was collected through a Google Forms survey, employing a pre-validated proforma to uphold study integrity. SPSS version 25 facilitated data analysis, assessing demographic variables through proportions and frequencies, and exploring the relationship between questionnaire domains and baseline data via the chi-square test. Statistical significance was established at a p-value of <0.05 .

Results

Participants ranged in age from 17 to 25 years old. Each domain's results are listed below.

Table 1: Distribution of participants

S.No	Year of Study	No.of females	Sample taken
1	1 st	300	129 (30%)
2	2 nd	200	85 (20.1%)
3	3 rd	250	146 (34.9%)
4	4 th	150	63 (15%)
	Total	1000	421 (100%)

The table presents the distribution of female participants according to their year of study and the number of samples collected. Out of a total of 1000 female students, samples were obtained from 421 participants, representing 100% of the study sample. Among them, the highest proportion of samples was collected from third-year students, accounting for 146 participants (34.9%), indicating the most active participation in that group. This was followed by first-year students, from whom 129 samples (30%) were collected. Second-year students contributed 85 samples (20.1%), while fourth-year students had the lowest participation, with 63 samples (15%). Overall, the table highlights that students in the middle years of study (particularly the third year) showed greater involvement in the study compared to those in the early and final years.

Table 2: Baseline Characteristics

S.No	Variables	Categories	N (%)
1	Age	≤18	131 (31.1)
		19 – 25	290(68.9)
2	Year of Study	1 st	126 (29.9)
		2 nd	85(20.2)
		3 rd	146 (34.6)
		4 th	64 (15.3)
3	Marital status	Married	29 (6.8)
		Unmarried	392 (93.2)

Table 2: delineates the fundamental characteristics of the student population, indicating that a predominant portion, 146 (34.9%), were in their third academic year, while 392 (93.2%) female respondents reported being unmarried, and 290 (68.9%) students were categorized within the age spectrum of 19 to 25 years.

Table 3: Frequency table on awareness of warning signs of Breast Cancer

S.No	Variables (Warning Signs)	N (%)	
		Yes	No

1	Lump in breast or thickening	353 (83.8)	68(16.2)
2	Thickening or Lump in your armpit	82 (19.5)	339 (80.5)
3	Nipple discharge or bleeding	212 (50.1)	216(49.9)
4	Change in Nipple Position	133 (31.6)	288 (68.4)
5	Rash around your breast	190(45.1)	231 (54.9)
6	Redness around the nipple	103 (24.4)	318 (75.6)
7	Dimpling of skin	171 (40.6)	250 (59.5)

The results are presented in Table 3; 353 individuals (83.8%) and 212 individuals (50.1%) of the participants acknowledged that the presence of a breast lump or thickening and nipple bleeding or discharge constitute potential indicators of breast cancer, respectively. Furthermore, 339 respondents (80.5%), 318 individuals (75.6%), 288 respondents (68.4%), 250 individuals (59.5%), and 231 individuals (54.9%) were unable to recognize the warning signs associated with breast cancer. A significant proportion, 325 (77.2%) and 407 (96.7%), strongly concurred that a previous history of breast cancer and obesity, respectively, are contributory risk factors for the disease. Conversely, 244 individuals (60.4%) expressed disagreement with the assertion that hormone replacement therapy elevates the risk of breast cancer.

Table 4: Frequency Table on Attitude, Confidence, and Behaviour of Breast Cancer

S.No	Variables (Attitude, Confidence, Behaviour)		N (%)
1	How often do you check your breast	At least once a week	23(5.5)
		At least once a month	44 (10.4)
		At least once every 6 months	78(18.5)
		Rarely or never	276 (65.6)
2	Do you think you would be able to tell if your breasts changed?	Very confident	41 (9.7)
		Fairly confident	87(20.6)
		Not very confident	224 (53.2)
		Not at all confident	69(17.2)
3	Have you ever visited a physician regarding a change you observed in one of your breasts?	Yes	52(12.3)
		No	307 (72.9)
		Never noticed a breast change	62(14.8)
4	How quickly would you call your	Within a week	103 (24.5)

	doctor if you noticed a change in your breast?	Within a month	193 (45.8)
		Within 6 months	71(16.8)
		Don't know	54(12.9)

Table 4 shows that 276 participants (65.6%) do not perform weekly breast self-examinations. Furthermore, 224 individuals (53.2%) lack confidence in detecting breast tissue changes. The majority of 307 individuals (72.9%) have not consulted a doctor about noticing breast changes.p value = $* < 0.05$ is statistically significant

Table 5: Association of Baseline Characteristics & Awareness of Warning Signs

S.No	Variables	Categories	Awareness of Warning signs		Chi-square test	P value
			Yes N=246	No N=175		
1	Year of Study	1 st Year	70 (55.5)	56(44.5)	17.192	0.001*
		2 nd Year	66(77.6)	19 (22.4)		
		3 rd Year	78(53.4)	68 (46.6)		
		4 th Year	32(50)	32(50)		
2	Marital Status	Married	18 (62)	11(38)	0.320	0.571
		Unmarried	228 (58.1)	164 (41.9)		

p-value = $* < 0.05$ taken as statistically significant

Notably, seventy-eight (53.4%) third-year students displayed awareness of breast cancer warning signs, in contrast to their peers within the same academic cohort, with this disparity also regarded as statistically significant (p=0.001).

Table 6: Association of Baseline Characteristics & Awareness of Risk Factors Measure

S.No	Variables	Categories	Awareness of Risk factors		Chi-square test	p-value
			Yes N=415	No N=6		
1	Year of Study	1 st	124 (98.4)	2 (1.6)	4.779	0.189
		2 nd	83 (97.6)	2 (2.4)		
		3 rd	145 (99.3)	1(0.7)		

		4 th	63(98.4)	1(1.6)		
2	Marital Status	Married	28 (96.5)	1(3.5)	0.195	0.659
		Unmarried	387 (98.7)	5 (1.3)		

p-value = *<0.05 taken as statistically significant

Table 7: Association of Knowledge on Warning Signs and Confidence, Attitude, and Behavior towards Breast Cancer

S.No	Variable	Categories	Knowledge of warning signs		Chi-square test	P value
			Present N=246	Absent N=175		
1	Confidence	Confident	91 (71.6)	26 (28.4)	12.685	0.0001*
		Not confident	155 (52.7)	149 (47.3)		
2	Attitude	Positive attitude	169 (57.1)	127 (42.9)	0.810	0.368
		Negative attitude125	77 (61.6)	48(38.4)		
3	Behavior	Good	16 (72.7)	6 (27.3)	1.869	0.172
		Bad	230(57.6)	159(42.4)		

p-value = *<0.05 taken as statistically significant

Table 7 shows that 71.6% of confident participants knew warning signs, a statistically significant difference (p=0.0001) compared to other participants. Meanwhile, 57.1% of those with a positive attitude and 72.7% of those displaying commendable behavior were aware of warning signs, though these findings were not statistically significant.

Discussion

This study assessed breast cancer awareness among female college students and revealed a general understanding of common risk factors and warning signs, similar to observations reported by Sarker et al., Gupta et al., and Alwan et al. However, notable gaps persisted regarding early detection methods. Although a majority of participants recognized key symptoms such as breast lumps and nipple discharge, awareness of other warning signs remained limited, which is consistent with findings reported by Boulos et al. and Hadi et al. Despite a generally positive attitude toward early detection, only about half of the participants demonstrated adequate confidence and skills in identifying breast cancer symptoms, as also noted by Ahmed et al. and Iheanacho et al.

The findings of this study are in agreement with earlier research indicating that delayed diagnosis in developing countries is largely attributable to inadequate awareness and insufficient screening practices, as highlighted by WHO et al., Gupta et al., and McCormack et al. Family history and tobacco use were commonly identified risk factors among participants, aligning with reports by Biswas et al. and Gebresillassie et al. However, awareness regarding other established risk factors such as obesity, alcohol

consumption, and reproductive factors was relatively poor, which mirrors the observations of Akhtari-Zavare et al. and Alwan et al. Furthermore, only a small proportion of participants were aware of the correct timing and frequency of breast self-examination, a finding consistent with studies conducted by Gürsoy et al. and Balaiah Mehanathan et al.

The limited awareness of breast self-examination practices among young women underscores the need for structured educational interventions within academic institutions. Peer education and targeted awareness programs have been shown to significantly improve knowledge and health beliefs related to breast cancer, as demonstrated by Gürsoy et al. and Sangwan et al. The present study focused exclusively on engineering students, which may restrict the generalizability of the findings to broader female populations, a limitation also acknowledged by Nyström et al. and Arnold et al.

Strengthening public health education initiatives remains critical to addressing existing knowledge gaps and promoting early detection behaviors. This is particularly important in low- and middle-income settings where access to mammography and advanced screening facilities is limited. Enhancing breast cancer awareness through community-based and institution-based programs may contribute to earlier diagnosis, timely medical consultation, and improved survival outcomes, as emphasized by WHO et al., Sangwan et al., and Arnold et al.

Conclusion

The research findings revealed a significantly low level of breast cancer awareness among women in the general population, which was affected by several factors previously mentioned. In a country like India, where cultural norms heavily influence society, it is essential to broadly enhance awareness, as these cultural factors may discourage women from seeking early detection methods such as mammograms. Continuous educational campaigns are necessary to disseminate information and improve knowledge about breast cancer.

Conflict of Interest: Nil

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