Unravelling Breast Cancer Risks and Early Detection Barriers in Above 30-Year-Old Women in Puducherry, India

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A B S T R A C T

Background: Breast cancer is the leading cause of cancer death among women all over the world and one of the most treatable cancers if detected early. The objective was to find out the lifetime risk of developing breast cancer and various factors associated with its development, and to identify various barriers to early detection of breast cancer among women in Puducherry.

Methodology: A cross-sectional study was conducted among 400 women who attended the outpatient department in the selected urban primary health centre. A proforma recorded information on sociodemographic characteristics, risk factors for breast cancer, and barriers to early detection of breast cancer. The lifetime risk of developing breast cancer was calculated using the Snehita breast cancer risk calculator.

Results: The mean age of participants was 42.7 years (±7.2). Using the Snehita Breast Cancer Risk Calculator, 39% of participants were identified as being at higher risk for developing breast cancer (risk score >0.5). Additionally, a family history of breast cancer was reported in 2.25% of the participants.

Conclusions: The lifetime risk of developing breast cancer is much higher among the study participants.

Key-words: Breast cancer, Snehita breast cancer risk calculator, barriers, risk factors for breast cancer, screening

A R T I C L E   I N F O

INTRODUCTION

Breast cancer is the most prevalent cancer as well as the leading cause of cancer-related deaths among women all over the world.[1] It is one of the most treatable cancers if detected in the early stage. In 2020, there were 2.3 million women diagnosed with breast cancer and 6,85,000 deaths globally.[2] As of the end of 2020, there were 7.8 million women alive who were diagnosed with breast cancer in the past 5 years, making it the world's most prevalent cancer.[2] In India breast cancer has overtaken cervical cancer as the most frequently diagnosed cancer among women.[3] Increased incidence and mortality seen in India in recent years are due to rapid urbanization, industrialization, population growth, and adoption of a more Westernized lifestyle.[4]

The etiology of breast cancer is multifactorial. Some of the well-established risk factors include advancing age, early age of menarche, age of first live birth, late menopause, and family history of breast cancer.[5] Lifestyle-related factors such as obesity, high waist-hip ratio, physical inactivity, and high triglycerides have also been associated with increased risk.[6] With the increase in the incidence of breast cancer, early detection and treatment are crucial for lowering mortality and improving patient outcomes. Studies have shown that early detection, particularly in high-risk women through regular screening increases the chance of successful treatment and significantly improves survival rates.[7] While mammography remains the gold standard for breast cancer screening, the American Cancer Society recommends that women aged 40 years and older should have a mammogram every year.[8] However, in resource-limited settings like India, mammography remains less accessible and acceptable. Additionally, lack of awareness about the importance of regular screening is a significant barrier to early detection. Even though the facilities were available our women did not utilize the services unless they were symptomatic.[9] This indicates the need for risk-based screening approaches, where women at high risk of developing breast cancer are identified and prioritized for intensive screening.

Various tools and risk assessment models such as the Gail model[10] have been developed globally to estimate an individual's risk of developing breast cancer. Gail score is used for women more than 35 years and it predicts the 5-year lifetime risk of developing breast cancer. Applying Western risk models to the Indian population will be challenging because of the unique risk profile and genetic heterogeneity. In India breast cancer tends to occur a decade earlier than in western women.

The A-J model developed as a part of Snehita Breast Cancer Risk Calculator in Kerala, India is an adaptation of international breast cancer risk assessment models, specifically designed to reflect the risk factors commonly seen in India.[11] In this background, the present study was conducted to find out the lifetime risk of developing breast cancer, to assess vari-ous factors associated with the development of breast cancer, and to identify various barriers to early detection of breast cancer among women in Puducherry using snehita breast cancer risk calculator[12] (A-J model).

METHODOLOGY

This cross-sectional study was conducted in the Puducherry district, located on the southeast coast of India and is surrounded by the state of Tamil Nadu. As per the Census of India 2011, Puducherry district with a population of 9,50,289 ranks first in terms of population among 4 districts of the Union Territory. Of the total population of the Puducherry district, 69.2% were from urban areas and 30.8% were from rural areas.[13] There are 32 PHCs in Puducherry district, 16 of which are in rural and 16 in urban areas. The study was conducted in the selected urban PHC attached to a tertiary teaching centre in the Puducherry district. The study was conducted for one year, from March 2023 to February 2024. We included women in the reproductive age group who attended the OPDs in the selected PHC.

Women >30 years, residing in the selected area for more than 6 months, and who attended the OPDs of selected PHC during the study period and gave consent were included in the study. Postmenopausal women and women already been diagnosed with breast cancer were excluded.

Using the formula for calculation of sample size of a cross-sectional study $n=Z^2p(1-p)/d^2$, where Z is the standard normal variate, the *P* value is taken from the study in Trivandrum by Jose R et al[14] which shows Normal risk=70% (147), Moderate risk=11.9%(25), High risk=10%(21) and Very high risk =8%(17).Taking standard normal variate as 1.96, absolute precision as 5%, and by taking the moderate, high, and very high risk together (29.9%) for calculating the proportion, the sample size was calculated to be 323. Assuming a non-response of 10% the final sample size is estimated to be 400.

Systematic random sampling was used to select participants. The average monthly OPD attendance of women aged >30 years in the PHC was 2,000. With a sample size of 400, the sampling interval was determined as 5. Every 5th eligible woman attending the OPD was enrolled in the study until the target sample size was achieved.

The purpose of the study was explained and informed written consent was obtained from the study participants. Data was collected using a pre-tested semi-structured questionnaire. Data collectors were trained to ensure consistency and accuracy in data collection. The questionnaire consists of three sections including sociodemographic characteristics, risk factors for breast cancer (Age at menarche, marital status, no of live births, age at first live birth, total duration of breastfeeding, h/o any current or past

breast pathologies and its management, number of previous breast biopsies, number of first-degree relatives with breast cancer) and barriers for early detection of breast cancer. The questionnaire was validated by face and content validation. After collecting details from the participants, the A-J model breast cancer tool (Snehita breast cancer risk calculator)[12] was used to find out the lifetime risk of developing breast cancer. Using this tool women were graded as normal risk and high risk.

A-J Model Breast Cancer Risk Assessment Tool[11,12]: The A-J Model is a logistic regression model for assessing the risk of breast cancer particularly tailored to the Indian context. It is based on seven known risk factors of breast cancer (age, age at menarche, age at first live birth, number of liver births, history of breastfeeding, number of first-degree relatives with breast cancer, total number of previous breast biopsies) in predicting women's lifetime risk for developing breast cancer. This tool is more accurate in women of more than 30 years.

A score more than or equal to 0.5 is graded as high risk and are educated and recommended clinical breast examination every 4 months and radiological breast examination yearly. Women with normal risk (score less than 0.5) are advised clinical breast examination yearly.

Statistical analysis and ethical considerations: The data were entered in MS Excel 2019. The data analysis was done using SPSS version 21. The results were presented as descriptive and inferential statistics. The continuous variables were presented in the form of mean and standard deviation. The categorical variables were expressed in frequency and percentages. The chi-square test was used to find the association between the two groups. A p-value of less than 0.05 was considered to be statistically significant. Approval from the Institute Ethics Committee was obtained before the start of the study (Approval number: 461/IEC-37/IGMC&RI/PP-12/2023, Date of approval-17/03/2023). Health education regarding breast self-examination methods and their importance was given to all participants at the end of data collection. Confidentiality was maintained throughout the study.

RESULTS

A total of 400 women of more than 30 years were included in this study. Mean(±SD) age of the study participants was 42.7±7.2 years. More than 80% of the participants were in the age group of 30-50 years. The majority (74.7%) were unemployed, and the median (IQR) family income was Rs. 20,000 (10,000-40,000). About 23.5% of participants reported a monthly income of more than Rs. 40,000, while 16.5% earned less than Rs. 10,000. Regarding socioeconomic status, more than half of the participants (62.75%) belonged to the upper or upper middle class, as per the modified BG Prasad scale. Only 4.75% of the participants were from the lower class.

Table 1: Risk factors for breast cancer among study participants(N=400)

Risk factor	Frequency (%)
Age at Menarche (Mean ± SD: 13.86 ± 1.3)	
<12 years	8 (2)
15-Dec	344 (86)
>15 years	48 (12)
Number of live births	
0	24 (6)
1	81 (20.25)
2	226 (56.5)
>2	69 (17.25)
Age at 1st live birth(n=376)	
<25 years	245 (65.2)
25-29 years	104 (27.7)
30 or more	27 (7.2)
Duration of breastfeeding (n=376)	
<24 months	203 (54)
24 or more	173 (46)
Family history of breast cancer	9 (2.25)
***Previous breast pathology**	11 (2.75)
Previous breast biopsy	6 (1.5)

*Fibroadenoma, fibrocystic disease, breast cyst, mastitis, etc.

Table 2: Association of sociodemographic factors and risk of developing breast cancer (N=400)

Sociodemographic variable	Risk of breast cancer		Total (%) (n=400)	P value	Unadjusted OR (95% CI)
	High (%) (n=156)	Normal (%) (n=246)			
Age group					
30-40	62 (39.7)	105 (43)	167 (41.75)	0.346	Ref
41-50	63 (40.4)	104 (42.6)	167 (41.75)		1.026 (0.658-1.598)
>50	31 (19.9)	35 (14.4)	66 (16.5)		1.5 (0.842-2.669)
Occupation					
unemployed	118 (75.6)	181 (74.2)	299 (74.8)	0.743	1.081 (0.6792-1.72)
Employed	38 (24.2)	63 (25.8)	101 (25.2)		Ref
Socioeconomic class (Modified BG Prasad sale)					
Upper	58 (37.2)	76 (31.1)	134 (33.5)	**0.002**	1.308 (0.484-3.531)
Upper middle	58 (37.2)	59 (24.2)	117 (29.3)		1.685 (0.619-4.581)
Middle	17 (10.9)	42 (17.2)	59 (14.8)		0.6939 (0.233-2.062)
Lower middle	16 (10.3)	55 (22.5)	71 (17.8)		0.4987 (0.168-1.477)
Lower	7 (4.5)	12 (4.9)	19 (4.8)		Ref

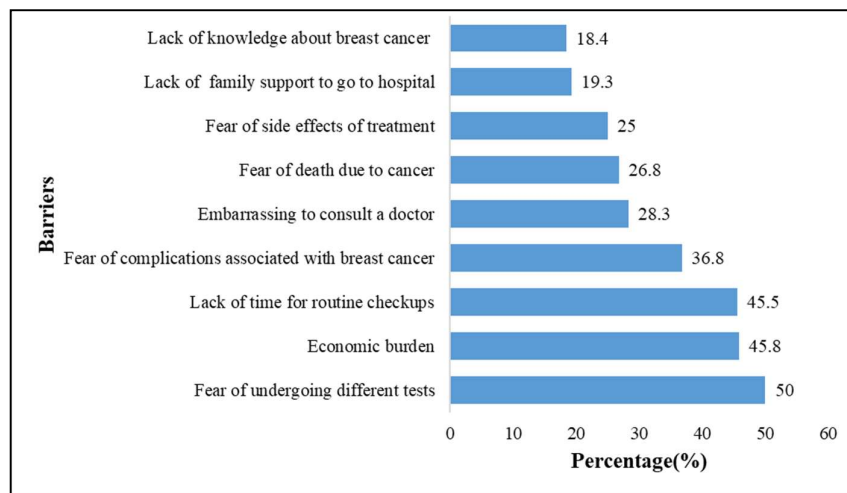*P* value <0.05 is considered as significant

Figure 1: Barriers to early detection of breast cancer among study participants (n=332)

The mean age of menarche was 13.86±1.3 years. Nulliparity was 6%, and 17.25% had more than two childbirths. First childbirth was before 25 years in 65.2%. Breastfeeding for over 24 months was seen in 46%. Family history, previous pathology, and biopsy were rare (<3%). Overall, 39% were high-risk per the Snehita Breast Cancer Risk Calculator (Table 1).

High breast cancer risk was significantly associated with socioeconomic class (p=0.002), with 74.4% from the upper/upper-middle class. Age, occupation, and income were non-significant. Most high-risk participants (40.4%) were 41-50 years old, and 75.6% were unemployed (Table 2)

Among the participants, only 39.75% (n=159) were aware of breast self-examination. Out of that, only 42.8%(n=68) were doing regular breast self-examination. Among the participants, 19% (n=80) were aware of mammography.

Figure 1 shows the barriers to early detection of breast cancer among the study participants. It was assessed among the participants who were not doing regular breast self-examination(n=332). Half of the participants reported the fear of undergoing different tests for the diagnosis of breast cancer. Among the participants, 25% had a fear of side effects of the treatment and 26.8% had a fear of death due to cancer. Most of the participants (45.5%) were not doing routine examinations due to lack of time. Only 18.4% participants lack knowledge about breast cancer.

DISCUSSION

The present study was conducted among women more than 30 years. The mean age of the study participants in this study was 42.7 years, The Majority of the study participants were in the age group of 30-50 years. In the study conducted by Jose R et al[14], the mean age of the participants was 38 years. In the current study, 74.7% of the participants were unemployed, similar findings were seen in the study con-

ducted by Paul S et al[15] in Varanasi. Where 84.4% of the participants were unemployed.

Among the risk factors for breast cancer, only 2% of participants had early menarche before 12 years, which is lower than the 18% observed in the study by Tiwari A et al[16]. The mean age of menarche in the current study was 13.86 years, which is similar to the 13.38 years reported by Jose R et al in Kerala.[14]

In the present study, 6% of participants were nulliparous, and 20.25% had one child, while in the study by Jose R et al., 15% were nulliparous and 38.9% had one child. The mean age of first live birth in this study was 22 years, which is comparable to the 23 years reported by Jose R et al.[14]

Around 2% of the study participants had a family history of breast cancer in the present study. Similarly in the study by Tiwari A et al[16] 1.6% of the participants had a family history of breast cancer. In the current study, 1.5% of the study participants had undergone previous breast biopsy, similarly in the study by Jose R et al 1.96% of the participants had a previous history of breast biopsy.

The current study also found that 39% of participants were at high risk of developing breast cancer, according to the A-J model for risk assessment. This is higher than the 29% at moderate to high risk found by Jose R et al. among healthcare workers in Kerala using the same model. Conversely, a retrospective study by Thomas S et al[17]. using the Gail model found that 86% of participants had a low lifetime risk of developing breast cancer, indicating that the Gail model may not be as effective for this population.

In the present study, 39.75% of the participants were aware of breast self-examination and 42.8% were doing regular breast self-examination. In the studies conducted by Paul S[15] et al and Tripathi et al[18] it is 16% and 7.2% respectively. High literacy levels in the present group may have contributed to greater awareness about breast self-examination. Only 19% of the participants in the present study were aware

of mammography. Similar findings were seen in the study done by Shadap A et al[9].

The most common barriers to early detection of breast cancer identified in this study were fear of undergoing diagnostic tests, economic burden, and lack of time. These findings align with the study by Jose R et al., where lack of time was the most common barrier (23.3%). In contrast, Tripathi et al[18] reported that 84.43% of participants lacked knowledge, which is much higher than the 18.4% lack of knowledge in the current study. The lower percentage of participants with a knowledge gap could be attributed to the higher literacy rate among the study group. Furthermore, in the study by Dalmeida D et al[19], barriers included lack of knowledge, fear of different tests, fear of surgery, and economic concerns. This indicates the importance of health education and awareness campaigns to promote early detection and timely intervention for breast cancer.

STRENGTH AND LIMITATIONS

The major strength of this study is that it identifies the lifetime risk of developing breast cancer using a validated tool specifically designed for the Indian population. The study also addresses the important sociocultural barriers to early detection. Identifying these barriers may help policymakers and health professionals develop more effective and specific intervention strategies. There is a possibility of recall bias since participants may not accurately remember or recall their personal and family history related to breast cancer.

CONCLUSION

This study shows the significant burden of high breast cancer risk among urban women in Puducherry. It also identifies significant barriers to early detection which include limited awareness, sociocultural and economic factors, etc. These findings necessitate the need for breast care awareness campaigns and improved access to screening and diagnostic services in India. Future studies with a longitudinal design are recommended to track changes in breast cancer risk over time and to validate the effectiveness of proposed intervention in improving early detection of breast cancer among the high-risk.

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