

Original Research Article

Risk factors for breast cancer among women reporting government tertiary care hospitals in Chennai, Tamil Nadu, Southern India: a cross-sectional study

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ABSTRACT

Background: Breast cancer is the most prevalent cancer among women globally and a major cause of cancer-related deaths, with 12% of women at risk during their lifetime. By 2030, global cases are projected to exceed 2 million annually, with India potentially reaching 200,000 cases per year. In India, breast cancer accounts for 13.5% of new cases and 10.6% of cancer deaths, being the most common in urban areas and the second most common in rural areas. Tamil Nadu has a high breast cancer burden, with the second-highest rate of disability-adjusted life years (DALYs). This study aims to analyze the risk factors contributing to high incidence and burden of breast cancer in Tamil Nadu.

Methods: This cross-sectional study, conducted from October 2021 to May 2022, involved five tertiary healthcare institutions in Chennai. Using a purposive sampling technique, 48 women diagnosed with breast cancer, from stage 0 to 4, were recruited. Data were collected through face-to-face interviews using a structured questionnaire.

Results: Participants were predominantly aged 41-50 years (35.4%) and from Northern Tamil Nadu (43.7%), with equal representation from rural and urban areas (50% each). Most were homemakers (58.3%) with a family income between ₹ 5,000-15,000 (58.3%). Significant risk factors included increasing age (OR=3.89), lower income (OR=3.35), and perceived importance of health (OR=2.09).

Conclusions: Increasing age, lower income, and general health importance are significant risk factors for breast cancer in Tamil Nadu. Enhanced screening programs, socioeconomic support, and health education initiatives are recommended to improve early detection and management.

Keywords: Breast cancer, Risk factors, Social determinants, Tamil Nadu

INTRODUCTION

Breast cancer is the most prevalent cancer among women globally, including in India (Global cancer statistics, 2012). Approximately 12% of women in the general population are at risk of developing breast cancer at some point in their lifetime.¹ Globally, breast cancer ranks as the fifth leading cause of cancer-related deaths, following colon, lung, liver, and stomach cancers.^{2,3} It is concerning that by 2030, the global incidence of breast cancer is expected to surge to over 2 million new cases annually,

with India likely will reach up to 200,000 cases per year. Breast cancer was the leading cause of cancer incidence and mortality in India, accounting for 13.5% of new cancer cases and 10.6% of all cancer deaths.⁴ In urban Indian women, breast cancer is the most prevalent type, while among rural women, it ranks as the second most common cancer.⁵ The northern and southern regions of the country showed the highest burden, with 685.5 and 677.6 DALYs per 100,000 women, respectively.⁶ At the state level, Tamil Nadu has the second highest crude rate of DALYs in India, with 667.6 per 100,000 women.⁶ The

crude and age-standardized incidence and mortality rates for each registry show that Chennai in Tamil Nadu had the second-highest crude incidence rate, following Thiruvananthapuram in Kerala.⁶ Due to the higher incidence and burden of breast cancer in Tamil Nadu, identifying the risk factors for the disease is crucial. Understanding these risk factors can aid in the developing targeted prevention strategies, improving early detection, and ultimately reducing the mortality rate. Therefore, this study aims to identify as well as analyze risk factors associated with the breast cancer among women in the Tamil Nadu.

METHODS

This cross-sectional study was conducted from October 2021 to May 2022 at five leading tertiary healthcare institutions in Chennai, India. These institutions were selected for their specialized oncology departments and their ability to serve a diverse population of cervical cancer patients. Study included 48 participants diagnosed with breast cancer, ranging from stage 0 to 4, who were attending the oncology outpatient departments (OPDs) of these hospitals. Inclusion criteria included individuals undergoing treatment, in remission (either permanent or temporary), or under regular follow-up at these centers. Exclusion criteria excluded participants with multiple cancers, those in terminal stages of cancer, individuals with severe cancer cachexia/ those unable to effectively communicate/respond during study period. Study employed purposive sampling to ensure representative sample of cervical cancer cases across different stages and demographic backgrounds within study sites.

Face-to-face interviews conducted with each participant to gather socio-demographic data, medical history, and details pertinent to breast cancer risk factors using pre-tested structured questionnaire. These interviews were conducted in a private setting to ensure confidentiality and encourage candid responses from participants.

Statistical analysis was conducted using SPSS version 21.0 (SPSS Inc., Chicago, IL, USA). Data were analyzed using descriptive statistics, including frequency and percentage distributions. The association of potential risk factors with cervical cancer was assessed using logistic regression analysis. Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to identify the potential risk factors for breast cancer and various socio-demographic variables.

RESULTS

In Table 1, the socio-demographic profile of the study participant's reveals a diverse age distribution, with the majority (35.4%) aged 41-50 years. Most respondents reside in Northern Tamil Nadu (43.7%), with equal representation from rural and urban areas (50% each). A significant proportion are married (79.2%) and have attained education up to middle school (31.2%). The occupational status is predominantly homemakers (58.3%) and daily wage workers (41.6%), with family incomes primarily ranging between ₹5,000-15,000 (58.3%). The average body mass index (BMI) indicates that more than half (56.2%) fall within the normal range (18.5-24.9). Consanguineous marriages were reported by 23%, and the majority had two children (39.6%). Breastfeeding duration for over half of the participants was between 12-18 months (52%). Most respondents reported no underlying medical conditions (70.8%), with a smaller percentage having a family history of cancer (27%). Contraceptive use was low, with only 16.7% reporting usage. The age of menarche was predominantly between 13-16 years (73%), while first coitus was largely at 19-35 years (60.4%). All participants had not yet reached menopause. Health was considered fairly important by 68.7% of the respondents.

Additionally, the majority (60.4%) live within 3 km of a healthcare facility, while 29.2% are 4 to 8 km away, and 10.4% are located 9 to 28 km from a healthcare provider.

Table 1: Socio-demographic information of study participants, (n=48).

Socio-demographic variables	N	Percentage (%)
Age (in years)		
21-30	1	2
31-40	7	14.6
41-50	17	35.4
51-60	15	31.25
61-70	8	16.6
Residing location		
Chennai and its suburban	17	35.4
Northern TN*	21	43.7
Central TN**	5	10.4
Southern TN***	3	6.2
Outside TN (Andhra Pradesh and Puducherry)	2	4.2
Place of residence		
Rural	24	50
Urban	24	50

Continued.

Socio-demographic variables	N	Percentage (%)
Marital status		
Unmarried	2	4.2
Married	38	79.2
Deserted	6	12.5
Separated	2	4.2
Education		
Uneducated	12	25
Primary school	8	16.7
Middle school	15	31.2
High school	7	14.6
Higher secondary/intermediate/ diploma	3	6.2
Graduate	3	6.2
Occupation (Self)		
Homemakers	28	58.3
Daily wage workers	20	41.6
Occupation (Spouse)		
Unemployed	13	27
Daily wage workers	28	58.3
Clerks	5	10.4
Technicians and associated professionals	1	2
Legislators, senior officials and managers	1	2
Monthly-income (Family) (INR)		
Nil	13	27
<5,000	2	4.2
5,000-15,000	28	58.3
>15,001	5	10.4
Average BMI (kg/m²)		
<16	4	8.3
16.1-18.4	1	2
18.5-24.9	27	56.2
25-29.9	13	27
>30	2	4.2
≥35	1	2
Consanguinity		
Yes	11	23
No	37	77
Number of children		
Nil	4	8.3
1	9	18.7
2	19	39.6
3 – 5	15	31.2
>5	1	2
Average breast-feeding duration (in months)		
<12	11	23
12-18	25	52
>18	12	25
Underlying medical conditions		
Nil	34	70.8
Diabetes mellitus	6	12.5
Hypertension	4	8.3
Other ailments	4	8.3
Family history of cancer		
Yes	13	27
No	35	73
Use of contraceptive pills/ barrier		
Yes	8	16.7
No	40	83.3

Continued.

Socio-demographic variables	N	Percentage (%)
Age of menarche (in years)		
10-12	11	23
13-16	35	73
>17	2	4
Age at first coitus		
≤18	19	39.6
19-35	29	60.4
Age of menopause		
Not yet	48	100
General importance given to health		
Very important	12	25
Fairly important****	33	68.7
Not important	3	6.2
Distance to health care facility (km)		
≤3	29	60.4
4-8	14	29.2
9-28	5	10.4

*Northern Tamil Nadu (TN)-Chengalpattu, Cuddalore, Thiruvallur, Kanchipuram, Kallakurichi, Thirupattur, Tiruvannamalai, Tiruvallur, Dharmapuri, Kalpakkam, Salem, Vellore, Krishnagiri, Neyveli, Villupuram. **Central Tamil Nadu (TN)- Nagapattinam, Kumbakonam, Mayiladuthurai, Pudukkottai, Tiruchirappalli, Dindugal. ***Southern Tamil Nadu (TN)- Karaikudi, Sivagangai, Theni, Ramanadhapuram, Tirunelveli, Madurai. ****Traditional healers, private AYUSH practitioners.

Table 2: Potential risk factors for breast cancer among study participants using logistic regression analysis.

Factors considered	Crude OR	95% CI for crude OR
Age (in years)	3.89	2.2-10.38
Education	2.01	1.54-3.12
Monthly income (INR)	3.35	1.75-13.34
Family history of cancer	1.27	1.04-3.68
General health-importance	2.09	1.26-10.42
Distance of healthcare facility from residence (in kms)	1.89	1.29-4.75

Table 2 provides significant risk factors for breast cancer among the study participants, emphasizing crude OR, with 95% CI, and associated p values. The Hosmer Lemeshow test for goodness of fit was not statistically significant $X^2(8)=13.31$, $p=0.1$. The model explained 33% (Nagelkerke R^2) of variance in identifying potential risk factors and correctly classified 77% of cases. The increasing age of patients (OR=3.89), monthly income of patients (OR 3.35) and their general importance towards health (OR=2.09) were found to be potential risk factors among breast cancer patients.

DISCUSSION

The socio-demographic profile of the study participants reveals a varied age distribution, with the largest proportion (35.4%) in the 41-50 years age group. This finding aligns with the study by Ivana et al which reported a broad age range among participants, from 13 to 87 years, with a median age of 41 years, indicating that breast cancer risk significantly increases with age.⁷

Most respondents in our study reside in Northern Tamil Nadu (43.7%) and are equally distributed between rural and urban areas (50% each). In contrast, Ivana et al study found a significant majority of patients living in urban areas (79.07%), highlighting geographical disparities in breast cancer incidence and access to healthcare.⁷

Marital status data shows that a considerable proportion of participants are married (79.2%), and a significant percentage have completed up to middle school education (31.2%). Predominant occupational status includes homemakers (58.3%) and daily wage workers (41.6%), with family incomes primarily between ₹5,000-15,000 (58.3%).

The average BMI of participants shows that more than half (56.2%) fall within the normal range (18.5-24.9). The median BMI was 22.48 kg/m², which is consistent with findings from Ivana et al study, where the median BMI was also reported to be within the normal range.⁷ Additionally, 23% of participants reported consanguineous marriages. The majority had 2 children (39.6%), and over half had a breastfeeding duration between 12-18 months (52%). These factors are known to affect breast cancer risk and are consistent with findings from previous studies.

A notable finding is that a majority of respondents reported no underlying medical conditions (70.8%) and had a family history of cancer (27%). Contraceptive use was low at 16.7%, and the age of menarche was predominantly between 13-16 years (73%), with first coitus occurring largely between 19-35 years (60.4%). All participants had not yet reached menopause, and health was considered fairly important by 68.7% of the respondents.

Additionally, the study highlights that 60.4% of participants live within 3 km of a healthcare facility, with 29.2% residing 4 to 8 km away, and 10.4% living 9 to 28 km from healthcare services.

Age emerged as a risk factor for breast cancer, with higher incidence rates observed in older women. Consistent with our study, existing literature confirms that the risk of breast cancer increases significantly with age.⁸ The study by Ivana et al reveals that for each one-unit increase in age, the odds of developing carcinoma increase by approximately 7%.⁷ This aligns with previous studies that identify elevated age as a major risk factor for breast cancer, particularly noting a peak incidence among menopausal women.⁹⁻¹² Additionally, the study results highlight the impact of social determinants on breast cancer outcomes, including factors such as income and knowledge about general health importance.¹³

CONCLUSION

The study identified several significant risk factors for breast cancer among the participants. Increasing age was identified as a key risk factor due to prolonged exposure to hormones like estrogen and progesterone, which can stimulate breast tissue growth and lead to cellular changes and mutations over time. Additionally, age-related changes in breast tissue, such as increased density, can make it more challenging to detect abnormalities, further increasing the risk. These factors highlight the need for targeted screening programs specifically designed for older women to ensure early detection and effective management of breast cancer. Socioeconomic status, as indicated by monthly income, also played a crucial role in influencing breast cancer risk, suggesting the need to address income-related disparities. Additionally, emphasis on health and its impact on risk levels underscores the importance of health perceptions in breast cancer management. To address these findings, it is recommended that healthcare systems implement enhanced screening programs for older women and develop initiatives to support individuals from lower socioeconomic backgrounds. Strengthening health education campaigns to boost awareness and promote regular health check-ups is also crucial for improving breast cancer management and outcomes.

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REFERENCES

1. SEER. Cancer Statistics Review, 1975-2014-SEER Statistics. Available at: https://seer.cancer.gov/archive/csr/1975_2014/. Accessed on 12 August 2024.
2. Cardoso F, Spence D, Mertz S, Corneliussen-James D, Sabelko K, Gralow J, et al. Global analysis of advanced/metastatic breast cancer: Decade report (2005-2015). *Breast Edinb Scotl*. 2018;39:131-8.
3. Kurian AW, Clarke CA, Carlson RW. The decline in breast cancer incidence: real or imaginary? *Curr Oncol Rep*. 2009;11(1):21-8.
4. Cancer Today. Available at: <https://gco.iarc.who.int/today/>. Accessed on 12 August 2024.
5. Asegaonkar S, Chaudhari SC, Bardapurkar JS. Lipid profile in breast cancer patients from rural India. *J Indian Med Assoc*. 2012;110(11):831-2.
6. Kulothungan V, Ramamoorthy T, Sathishkumar K, Mohan R, Tomy N, Miller GJ, et al. Burden of female breast cancer in India: estimates of YLDs, YLLs, and DALYs at national and subnational levels based on the national cancer registry programme. *Breast Cancer Res Treat*. 2024;205(2):323-32.
7. Eremici I, Borlea A, Dumitru C, Stoian D. Breast Cancer Risk Factors among Women with Solid Breast Lesions. *Clin Pract*. 2024;14(2):473-85.
8. Dumitrescu RG, Cotarla I. Understanding breast cancer risk-where do we stand in 2005? *J Cell Mol Med*. 2005;9(1):208-21.
9. Tyrer J, Duffy SW, Cuzick J. A breast cancer prediction model incorporating familial and personal risk factors - Tyrer. *Stat Med*. 2004;23(7):1111-30.
10. Dimitrova N, Znaor A, Agius D, Eser S, Sekerija M, Ryzhov A, et al. Breast cancer in South-Eastern European countries since 2000: Rising incidence and decreasing mortality at young and middle ages. *Eur J Cancer Oxf Engl*. 2017;83:43-55.
11. Degnim AC, Daniel WV, Hal KB, Marlene HF, Thomas AS, Robert AV, et al. Stratification of Breast Cancer Risk in Women With Atypia: A Mayo Cohort Study. *J Clin Oncol*. 2007;25(19):2671-7.
12. Coughlin SS. Social determinants of breast cancer risk, stage, and survival. *Breast Cancer Res Treat*. 2019;177(3):537-48.
13. Anothaisintawee T, Cholatip W, Panuwat L, Vijj K, Sansanee W, Jiraporn S, et al. Risk Factors of Breast Cancer: A Systematic Review and Meta-Analysis. *Asia Pac J Public Health*. 2013;25(5):368-87.

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