

Original Research Article

A study on demographic profile of breast cancer in South India: A hospital-based study

Sailaja Suryadevara¹, Srilakshmi², Paruchuri Naga Manvi^{3,*} and Yendapu Rajasekhar⁴

¹ Department of Surgical Oncology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India.

² Department of Obstetrics and Gynaecology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India.

³ Department of General Surgery, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India.

⁴ Department of Social and Preventive Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India.

* Correspondence: vlnvraju@gmail.com

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Abstract: Background: Breast cancer is the most common malignancy among women worldwide. According to the GLOBOCAN 2020 estimates of cancer incidence and mortality, female breast cancer has surpassed lung cancer and is now the most commonly diagnosed cancer, with an estimated 2.3 million new cases. In India, breast cancer has moved from being the fourth most common cancer in the 1990s to the first. The prevalence of established hormonal and reproductive risk factors is higher in Western countries, but these risk factors are not commonly observed in the rural population of India. Therefore, it is important to study the probable risk factors in our population, including the potential role of obesity, especially in postmenopausal women, in the development of breast cancer.

Aim and Objectives: The aim of our study is to determine the demographic profile of breast cancer patients and identify any associated risk factors for breast cancer in this population.

Methods: This analytical cross-sectional study was conducted at Alluri Sita Rama Raju Academy of Medical Sciences (ASRAM) over a period of one year from March 2021 to February 2022. We included 72 patients with histologically proven breast carcinoma who attended the Oncology OPD and met the inclusion criteria.

Results: In our study, approximately 86% of breast cancer patients had a body mass index (BMI) greater than 23. Obesity is known to be associated with increased estrogen levels, which can be a risk factor for hormonal-dependent breast cancer. Among the study group, 52% were luminal positive, 25% were triple negative, and 22.2% were HER2 neu positive.

Conclusion: Our study found that approximately 86% of breast cancer patients were obese. The association between BMI and breast cancer needs to be further studied in randomized control trials. Furthermore, reproductive and hormonal risk factors were not significantly observed in our population group.

Keywords: Breast carcinoma; Obesity; Luminal positive; Triple positive.

1. Introduction

Breast cancer is the most common malignancy among women worldwide. According to GLOBOCAN 2020 estimates of cancer incidence and mortality, female breast cancer has surpassed lung cancer and is now the most commonly diagnosed cancer, with an estimated 2.3 million new cases [1]. Death rates for female breast and cervical cancers, however, were considerably higher in transitioning countries compared to transitioned countries (15.0 vs 12.8 per 100,000 and 12.4 vs 5.2 per 100,000, respectively) [1]. In India, it has surpassed carcinoma cervix and become the most common malignancy. It was previously ranked fourth on the list of most common cancers in India in the 1990s [2]. Due to the lack of a cancer registry in India, the exact burden of the disease is unknown. As breast cancer is a surface organ, breast self-examination should be encouraged, especially among women over 40 years of age, in resource-constrained countries like India,

where population-based screening mammography is challenging. Breast self-examination and awareness of breast cancer can aid in its early diagnosis. The established hormonal and reproductive risk factors for breast cancer include early age at menarche and late menopause, nulliparity, advanced age at first childbirth, less breastfeeding, usage of oral contraceptive pills, and hormone replacement therapy. These risk factors are more prevalent in Western countries, but they are not commonly observed in the rural population of India. Therefore, it is necessary to study the probable risk factors in our population. Obesity, especially in postmenopausal women, has shown mixed results regarding its role in the causation of breast cancer.

Breast cancer is associated with established modifiable and non-modifiable risk factors. The presentation and risk factors may vary in the Indian population compared to the rest of the world. There have been limited studies conducted in the Indian population. Our medical college serves as a tertiary center, primarily catering to the rural population. The majority of our breast cancer patients come from a low socioeconomic status, have limited education, and got married at an early age (less than twenty). They are multiparous and breastfeed their children. Some are housewives, agricultural laborers, or daily wage laborers. Only a few follow a vegetarian diet, consuming non-vegetarian food two to three times a week. They do not have any addictions to alcohol or smoking. Most of them are unaware of cancer screening protocols and breast cancer screening. The use of oral contraceptive pills or hormone replacement therapy is not common in this population. However, with the westernization of diet, changes in marriage practices, increasing literacy rates, and alterations in the childbearing age, there may be changes in the presentation of breast cancer in future generations of our population. The diagnosis of breast cancer in our patients is mostly incidental findings of lumps. This study aims to enhance our understanding of the disease in our native population and may provide valuable insights for future reference.

2. Aim

The aim of our study is to understand the demographic profile of breast cancer patients and attempt to identify any risk factors associated with breast cancer in this population.

3. Material and Methods

3.1. Study design

An institutional-based analytical cross-sectional study.

3.2. Study area

The study was conducted at Alluri Sitarama Raju Academy of Medical Sciences (ASRAM) in Eluru District, Andhra Pradesh.

3.3. Study period

The study was conducted for one year, from March 2021 to February 2022.

3.4. Study population

The study population included all patients with biopsy-proven breast carcinoma who presented to the surgical oncology OPD.

3.5. Sample size

A total of 72 patients who met the inclusion and exclusion criteria were included in the study.

3.6. Methodology

Data was collected using a questionnaire, biopsy, and staging work-up of the tumor. Body Mass Index (BMI) was calculated based on weight in kilograms and height in meters. BMI was classified according to the criteria for the Asian population: underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5\text{-}22.9 \text{ kg/m}^2$), overweight ($23\text{-}24.9 \text{ kg/m}^2$), obese 1 ($25\text{-}29.9 \text{ kg/m}^2$), and obese 2 ($\geq 30 \text{ kg/m}^2$). Staging was performed according to the AJCC staging system, 8th edition. Receptor expression of Estrogen Receptor (ER), Progesterone Receptor (PR),

and Her-2/neu were analyzed from biopsies. The molecular subtypes were categorized as triple negative, Her2-enriched (if Her-2/neu is positive irrespective of receptor status), and luminal subtypes.

3.7. Inclusion criteria

All cases of histologically proven carcinoma breast who attended the OPD during the study period were included.

3.8. Exclusion criteria

Those who were unwilling to participate or answer the questionnaire were excluded.

3.9. Statistical analysis

The data was entered into a Microsoft Excel sheet. The percentage of patients in all variables, such as age, marital status, age at first childbirth, parity, breastfeeding status, family history, stage at presentation, and BMI, was calculated. The means of age at presentation, BMI, and age at first childbirth were calculated. Fisher's exact test was performed to determine the association of the variables with breast receptors. A p-value of less than 0.05 was considered statistically significant.

3.10. Ethical issues

Clearance from the institutional ethical committee was obtained prior to the start of the study. Written consent was taken beforehand for their participation.

4. Results

Table 1. Showing the frequencies of different demographic variables

Variables	Count	Column N %
Age	30-49 years	18 25.0%
	50-69 years	37 51.4%
	70-89 years	17 23.6%
Marital status	YES	71 98.6%
	NO	1 1.4%
Parity	Nulliparous	5 6.9%
	Parous	67 93.1%
Age of first child birth	= 20 years	54 80.6
	21- 25 years	8 11.9
	26-30 years	5 7.5
Breast Feeding status	= 6 months	17 23.6%
	>6 months	50 69.4%
	Nulliparous	5 6.9%
Family history	YES	2 2.8
	NO	70 97.2
Stage of cancer	STAGE I	3 4.2%
	STAGE II	45 62.5%
	STAGE III	19 26.4%
	STAGE IV	5 6.9%
BMI	Underweight (<18.5)	1 1.4%
	Normal weight (18.5-22.9)	9 12.5%
	Overweight (23-24.9)	8 11.1%
	Obese 1 (25-29.9)	32 44.4%
	Obese 2 (=30)	22 30.6%
BMI	BMI <23	10 13.9%
	BMI = 23	62 86.1%
Breast Receptors	Triple Negative	18 25.0%
	Luminal Positive	38 52.8%
	Her 2 Neu Positive	16 22.2%

[Table 1] Our study group includes a total of 72 patients. In the age category, 51% were between 50-69 years, 25% constituted 30-49 years age group and 23% were between 70-89 years. Except one all were married, 7% were nulliparous. 80% conceived at age less than 20 years, 11% between 21-25 years and 7% between 26-30 years. Breast feeding was given for less than 6 months in 24% of patients and 69% breast fed for more than 6 months. Two patients had family history of breast cancer. About 63% of patients were in stage II, 26% were in stage III, and 4% were in stage I and 7% were in stage IV. Most of them i.e., 86% patients had BMI greater than 23. Among them 44% were obese 1, 30% were obese 2, and 11% were overweight. 12% were in normal weight range and only 1 percent were underweight. Luminal positive was seen in 52% of patients, 25% were triple negative and 22% were Her 2 neu positive.

Table 2. Showing the descriptive statistics of different variables

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	72	33	85	59.10	12.600
BMI	72	17.78	37.39	27.8226	4.34102
Age of first child birth	67	14	35	19.39	3.818

[Table 2] In our study, the mean of age of presentation was 59 years with minimum age of 33 years and maximum age of 85 years. The mean BMI was 27 which ranged from 17.78 to 37.39. The mean age at first child birth was 19 years with minimum age of first child birth 14 years and maximum of 35 years.

Table 3. Showing the association of Breast receptors with different variables

Variables	Breast_Receptors			Fisher's exact test value	df	p-value	
	Triple Negative N (%)	Luminal Positive N (%)	Her 2 Neu Positive N (%)				
Age	30-49 years	7 (38.9%)	7 (38.9%)	4 (22.2%)	4.771	4	.312
	50-69 years	6 (16.2%)	21 (56.8%)	10 (27.0%)			
	70-89 years	5 (29.4%)	10 (58.8%)	2 (11.8%)			
Marital status	YES	17(23.9%)	38 (53.5%)	16 (22.5%)	3.042	2	.218
	NO	1(100.0%)	0 (0.0%)	0 (0.0%)			
Age of first child birth	= 20 years	13(24.1%)	29 (53.7%)	12 (22.2%)	2.375	4	.667
	21- 25 years	2(25.0%)	5 (62.5%)	1 (12.5%)			
	26-30 years	0(0.0%)	3 (60.0%)	2 (40.0%)			
Parity	Nulliparous	3(60.0%)	1 (20.0%)	1 (20.0%)	3.739	2	.154
	Parous	15(22.4%)	37 (55.2%)	15 (22.4%)			
Breast Feeding status	= 6 months	2(11.8%)	10 (58.8%)	5(29.4%)	5.329	4	.255
	>6 months	13(26.0%)	27 (54.0%)	10 (20.0%)			
	Nulliparous	3(60.0%)	1 (20.0%)	1 (20.0%)			
Family history	YES	0(0.0%)	2 (100.0%)	0 (0.0%)	1.841	2	.398
	NO	18(25.7%)	36 (51.4%)	16 (22.9%)			
Stage of cancer	STAGE I	1(33.3%)	1 (33.3%)	1(33.3%)	4.683	6	.585
	STAGE II	9(20.0%)	28 (62.2%)	8 (17.8%)			
	STAGE III	6(31.6%)	7 (36.8%)	6 (31.6%)			
	STAGE IV	2(40.0%)	2 (40.0%)	1 (20.0%)			
BMI	Underweight	0(0.0%)	0 (0.0%)	1 (100.0%)	9.866	8	.275
	Normal weight	3(33.3%)	6 (66.7%)	0 (0.0%)			
	Overweight	1(12.5%)	4 (50.0%)	3 (37.5%)			
	Obese 1	8(25.0%)	19 (59.4%)	5 (15.6%)			
	Obese 2	6(27.3%)	9 (40.9%)	7 (31.8%)			
BMI	BMI <23	3(30.0%)	6 (60.0%)	1 (10.0%)	1.012	2	.603
	BMI >23	15(24.2%)	32 (51.6%)	15 (24.2%)			

[Table 3] In our study, 30-49 years age group, about 39% were triple negative, 39% were luminal positive and 22% were her 2 neu positive. In 50-69 years age group 16% were triple negative, 57% were luminal positive, 27% were her 2 neu positive. In 70-89 years age group 29% were triple negative, 58% were luminal positive, and 12% were her 2 neu positive. The analysis showed that triple negative percentage was more in 30-49 years age group. Luminal positive percentage increased in 50-60 and 70-89 years by 19-21%. Her 2 neu percentage was less in 70-89 years age group (P-value=0.3)

All age groups had higher percentage of luminal positive (62% in 21-25 years age, 53% in <20 years age group and 60% in 26-30 years age group) irrespective of age at first child birth (P-value = 0.6)

Multiparous had 55% luminal positive and nulliparous had 20% luminal positive receptors (P-value =0.1). Luminal positive in breast fed women less than 6 months and more than 6 months was 58 % and 54%

respectively (P-value = 0.2). Family history of breast cancer have 100 percent luminal positive and others have 51% luminal positive (P-value = 0.3).

Stage I had 33% in each receptor type. Stage II had 62% luminal positive, 20% triple negative, 18% her2 neu positive. Stage III had 37% luminal positive, 32% each in triple negative and her2 neu positive. Stage IV had 40% luminal positive, 40% triple negative and 20% her2neu positive (P-value = 0.5).

BMI less than 23 had 60% luminal positive, 30% triple negative and 10% her2neu positive. BMI greater than 23 had 51% luminal positive, 24% triple negative and 24% her2neu positive (P-value = 0.6).

All the variables comparative analysis showed that there is no statistically significant association between age, marital status, age at first child birth, parity, breast feeding, family history, stage of cancer BMI and receptor status.

Obesity was prevalent in 86% of breast cancer patients. Mean age of presentation was 59 years and 62% were in stage II. Luminal positive breast cancers were 53%, triple negative status was in 25% of patients her2 neu was positive in 22%.

5. Discussion

Breast cancer is the most common cancer in India among female cancers [2]. The incidence of breast cancer is increasing rapidly in Indian population. India has diversity of population ranging from urban to rural areas. The changing lifestyle of Indians may have a role on rapidly increasing incidence of breast cancer. A study of native population may help in developing risk prevention strategies. Urbanization and change in marriage practice may change the pattern of disease here in future.

The mean age of presentation was 59 years in our study group. Studies done on Indian population have shown that breast cancer was seen in younger population in India [3] compared to West. But it was discussed as bias of clinical presentation [4], as younger populations were able to travel cancer centers for cancer treatment rather than older ones.

There is evidence for association of hormonal positive breast cancers and reproductive risk factors such as nulliparity, usage of OC pills, increased age at first child birth and decreased age at menarche with hormonal positive cancers but not TNBC [5]. In our study group majority have no hormonal or reproductive risk factors as majority have rural background, and had first child birth at a younger age. Probably that is the reason that in our study group we didn't find any significant association between reproductive risk factors and receptor type of breast cancer.

In our study group 3% were in stage 1, 62% were in stage 2, 26% were in stage 3 and 7% were in stage four. 60% to 70% of all patients with breast cancer in the United States were diagnosed with stage 1 disease, whereas only approximately 1% to 8% of Indian women present with stage 1 [6] disease. Although only approximately 10% of women in the United States present with stage IV disease, in India this number is approximately 6% to 24%, with approximately 29% to 52% of Indian women presenting at stage III [7]. TATA cancer centre, Mumbai in an audit in 2009 published data that breast cancer patients were in stage 1 and 2 in 40%, 38% in stage 3 and 21% in stage 4 [8]. In dinesh Chandra doval *et al.*, [9], Among the 3453 patients, stage I, II, and III cases were 11.75%, 66.79%, and 21.64%, respectively [10]. The increasing awareness of breast cancer in India can change the trend to earlier stage at presentation.

In our study, about 86% of our breast cancer patients have BMI more than 23. Obesity has a relation to increased estrogen levels which can be a risk factor for hormonal dependent breast cancer. In study of P Singh *et al.*, [11] BMI was found to have association with breast cancer. A study conducted in USA among postmenopausal women it was found that weight, BMI, and breast density were independently associated with breast carcinoma risk [12].

In our study group luminal positive were 52% which is in accordance with Indian studies, Triple negative in our study group were 25 percent. India was reported to have the highest number of triple negative breast cancer (28%) compared to west [13]. In dinesh Chandra doval *et al.*, in Dinesh Chandra doval *et al.*, hormone receptor positive/HER2 negative, triple negative (TNBC) and hormone receptor any/HER2 positive cases were 55.2%, 24.2% and 20.6%, respectively [10]. Triple negative breast cancers are aggressive tumors and have poor prognosis compared to luminal positive tumors. Western studies carried out by Ithemelandu CU *et al.*, [14] and Park S *et al.*, [15] documented that the most common molecular subtype in their study was Luminal positive which is similar to our study.

Table 4. Comparison of percentages of molecular subtypes of different studies with our study

Variables		Studies			
		Onitillo AA <i>et al.</i> , [16]	Geethamala K <i>et al.</i> , [17]	Ambroise <i>et al.</i> , [18]	Our study
Molecular subtype	Luminal positive	68.9%	54%	48%	52.8%
	Her 2 neu positive	17.7%	26%	27%	22.2%
	Triple negative	13.4%	20%	25%	25%

6. Limitations

Age of menarche could not be elicited exactly, most had at around 13 year's age and age of menopause is biased as 30% of our patients underwent hysterectomy for causes not clearly known. Oophorectomy status was not known in them.

6.1. Conclusion

About 86 percent of breast cancer patients were obese. The association between BMI and breast cancer has to be studied in further randomized control trials. Reproductive and hormonal risk factors are not seen significantly in our population group. 62% are in stage II and 53% have luminal positive receptors. There was no statistically significant association between age, obesity and other variables with receptors in our study group.

6.2. Recommendations

Encouraging breast self examination and screening mammography from 40 years age group onwards will help in early diagnosis of breast cancer. Maintaining Cancer registry in India will help to know the exact burden of the disease in our country.

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