



Breast cancer - Clinicopathological profile at a Tertiary Cancer Center in India

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ABSTRACT

The demographic characteristics of breast cancer patients from disparate geographical regions vary considerably. Accordingly, the objective of this study was to present the clinicopathological features of breast cancer patients at our center and to conduct a comparative analysis with the findings of other studies. This retrospective descriptive study, which included 816 patients registered in the two years between October 2021 and September 2023, was conducted in the Department of Medical Oncology at a government tertiary cancer care center in southern India. At the initial presentation, the median age was 49 years, with the majority of patients being postmenopausal. The most common presenting complaint was a breast lump, which was reported in 636 cases (77.9%). Additionally, 115 cases (14.09%) involved axillary edema. A family history of breast cancer was evident in 19.9% (162/816) of the patients. Of the patients, 594 (72.8%) exhibited hormone receptor positivity. Of the total number of cases, 202 (nearly 25%) were positive for HER2/neu by FISH or IHC. A total of 178 patients (21.9%) were diagnosed with triple-negative breast cancer (TNBC). The majority of patients (46.8%) presented at a late stage, classified as Stage III. In cases of stage IV disease, there was a greater prevalence of skeletal metastases (40.3%) compared to visceral metastases. The present study offers insight into the current state of breast cancer patients in Southern India. The majority of patients were postmenopausal. Additionally, there has been an observed increase in the number of patients with hormone receptor-positive tumors, accompanied by a higher prevalence of metastatic disease involving skeletal metastasis compared to other sites. It is imperative to enhance awareness about breast cancer, assuage apprehensions, and disseminate information about the significance of screening, prompt diagnosis, and treatment. Such studies provide a foundation for understanding the extent of the problem and facilitate the identification of potential solutions.

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1. Introduction

Among females, breast cancer represents the most frequent malignant neoplasm. In Asia, this cancer represents 10% of all cancers, with 845,400 cases [2]. In India, it represents 13.5% (178,361 cases) of all malignant neoplasms and 10.6% (90,408 deaths) of all fatalities. Demographic research has estimated that the global incidence of this cancer will reach almost 3 million by 2040. In our country, the annual percentage change (APC) in age-adjusted incidence rates (AAR) over the period demonstrates a progressively increasing trend in the incidence of this malignancy across all population-based cancer registries (PBCRs), with the exception of the Nagpur PBCR. Significant discrepancies are observed in the incidence rates across rural, urban, and metropolitan areas in India. The age-adjusted rate in urban Chennai and Delhi was 37.9 and 41 per 100,000 population, respectively, while the incidence rates for major cities such as Pune and Nagpur were 26.4 and 29.3 per 100,000 inhabitants, respectively. Nevertheless, the incidence rate was lower in the rural area of Barshi, at 12.4 per 100,000 individuals [5]. The demographic characteristics of Indian patients with breast cancer exhibit some differences from those observed in Western populations. A greater proportion of Indian patients are younger, with nearly half of them are premenopausal. [6, 7]. The following risk factors have been identified as contributing to the development of this malignancy: age, family history, age at menarche and menopause, parity, prior breast biopsy, obesity, diet, socioeconomic status, history of radiation exposure, use of oral contraceptive pills and hormone replacement therapy. A substantial body of research in epidemiology, clinical characteristics, and pathological and molecular levels demonstrates that breast cancer is not a single disease entity, but rather a heterogeneous collection of distinct pathological and molecular subtypes. A multitude of clinicopathological characteristics influence prognosis, including age, menopausal status, sex, family history, stage, histological type, grade, hormonal receptor status, human epidermal growth receptor 2 (HER2) status, performance status, and the treatment administered. A paucity of current literature exists on the clinicopathological characteristics of patients with breast cancer from South India. Accordingly, this study was conducted at a tertiary care center in Karnataka with the objective of reporting the clinicopathological characteristics of patients with breast cancer and comparing them with data from the rest of India.

2. Materials and Methods

1. This descriptive study was conducted retrospectively in the Department of Medical Oncology at a tertiary cancer care center in southern India, following the requisite administrative approval. As the study was primarily based on the analysis of retrospective data, approval from the institutional review board was not required. The case files of all patients with breast cancer who registered with the

department between October 2021 and September 2023 were examined and studied. The study included all adult female patients with a diagnosis of breast cancer (age ≥ 18) who were diagnosed at the hospital. This encompasses patients who were referred from other medical facilities with a clinical suspicion of breast cancer. Patients with breast cancer who were male or who were unable to provide informed consent were excluded from the study.

2. With the exception of patients with early-stage breast cancer, all staging procedures involved either a bone scan and contrast-enhanced computed tomography (CECT) or positron emission tomography-computed tomography (PET-CT). The American Joint Committee on Cancer (AJCC) Tumor-Node-Metastasis (TNM) staging system was employed to ascertain the patient's stage. TNBC was classified as a cancer that was negative for estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2/neu) expression. Immunohistochemistry (IHC) tests were conducted using kits that had been approved by the Food and Drug Administration. Antibody staining of paraffin-embedded slides for estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) was performed for each patient. An immunohistochemical (IHC) analysis of the tumor was considered positive if the HER2 score was three or greater.

3. Patients exhibiting an IHC score of HER-2 neu 2+ were subjected to a fluorescence in situ hybridization (FISH) examination. In accordance with the standards established by the American Society of Clinical Oncology (ASCO) and the College of American Pathologists (CAP), a HER-2 score of 0 or 1 was deemed indicative of a negative result. A descriptive analysis was conducted on the patient, the illness, and the course of treatment. Quantitative variables were summarized using the mean, median, and range, whereas categorical variables were summarized using frequency. Patients or their family members provided the informed consent. As the data set did not include the identifying information of the patients, confidentiality was maintained. The protocols were conducted in accordance with the ethical principles established by the 2013 revision of the Helsinki Declaration of 1964 and the guidelines set forth by the competent committee on human testing.

3. Results

Over the course of the two-year study period, our Institute documented 849 cases of breast cancer. Of the aforementioned cases, records were unavailable for 26 cases, and an additional five cases involved male patients. The study encompassed the analysis of data pertaining to 816 patients. The age of the subjects ranged from 24 to 75, with a median age of 49. Concurrently, 62.3% of the population was postmenopausal (Table 1). A greater proportion of the women in this study were from rural backgrounds (74.8%) compared to urban women (25.2%) [610/816]. This likely reflects the tendency of patients from lower socioeconomic backgrounds to seek treatment at

Table 1. Baseline Characteristics

| Variables | Frequency |
|---------------------------------|------------------------|
| Median age | 49 years (24-75 years) |
| Menopausal status | |
| Premenopausal | 308 (37.7%) |
| Postmenopausal | 510(62.3%) |
| Family history of cancer | 162(19.8%) |
| Sidedness | |
| Left-sided tumor | 468 (57.4%) |
| Right-sided tumor | 348 (42.6 %) |
| Receptor status | |
| HR positive | 594 (72.8%) |
| Her 2 positive | 202 (24.8%) |
| TNBC | 178 (21.9%) |
| Histology | |
| IDC | 733 (89.8%) |
| Metaplastic | 20(2.4%) |
| Medullary | 14(1.7%) |
| Lobular | 13(1.6%) |
| Papillary | 10(1.2%) |
| Others | 26(3.2%) |
| Grade of differentiation | |
| Grade I | 146(17.9%) |
| Grade II | 484(59.3%) |
| Grade III | 186 (22.8%) |

government-run facilities. The median age at menarche was 14 years. Five women were nulliparous. For those with children, the median age at first pregnancy was 25 years old (range: 16 to 36 years). The most common presenting complaints were breast lumps, accounting for 636 cases (77.9%) and 115 cases (14.09%) of axillary edema. A total of 53 individuals (6.49%) reported the presence of a breast ulcer. In comparison to the right side, the left side was observed to be more prevalent (57.4%; 468/816). The mean number of children per family was 2.2. A family history of breast cancer was evident in 19.9% (162/816) of the patients. The most prevalent histological subtype was infiltrating ductal carcinoma (NOS). In the majority of cases, the grade of differentiation was identified as grade 2. Of the total number of patients, 594 (72.8%) exhibited positivity for hormone receptors. Of the total number of patients, 202 (approximately 25%) tested positive for Her2/neu. Her2 is only routinely performed by immunohistochemistry (IHC) alone, with fluorescent in situ hybridization (FISH) testing being reserved for equivocal results (2+). A total of 178 patients exhibited instances of triple-negative breast cancer (TNBC), representing 21.9% of the total cases. A considerable proportion of patients exhibited Stage III characteristics. In cases of stage IV disease, there was a greater prevalence of skeletal metastases 75 (40.3%) compared to visceral metastases.

Oligometastatic disease was identified in 18.2% of all patients with stage IV disease (34/186 patients). A considerable proportion of patients exhibited multiple sites of metastasis involving a range of organs. **Table 2** illustrates the distribution of metastatic sites and the corresponding stage of presentation.

Table 2. Stage of disease and Sites of Metastasis in case of Stage IV disease

| TNM Stage of disease | |
|----------------------------|-------------|
| Stage I | 10(1.2%) |
| Stage II | 238 (29.2%) |
| Stage III | 382 (46.8%) |
| Stage IV | 186 (22.8%) |
| Sites of metastasis | |
| Bone | 75 (40.3%) |
| Lymph Nodes | 40 (21.5%) |
| Lung | 70 (37.6%) |
| Liver | 38 (20.4%) |
| Pleural Effusion & Ascites | 12 (6.4%) |
| Brain | 10 (5.3%) |

4. Discussion

Among females, breast cancer represents the most frequent malignant neoplasm in terms of both incidence and mortality. There is considerable heterogeneity in the risk factors, epidemiology, and pathology associated with this cancer across different age groups in various regions of India and globally. Some evidence indicates that patients from India may exhibit distinct characteristics compared to those from Western populations. In a study conducted by Hirko et al., it was demonstrated that patients under the age of 45 represent the most prevalent demographic affected by cancer in the Egyptian population [9]. A further Indian study by Bhat et al. from north India yielded comparable findings [10]. However, in our study, the majority of females were postmenopausal, which is in accordance with the findings of the National Cancer Registry Programme, which indicate that the incidence of this malignancy is highest in the fifth to sixth decade of life in India. The majority of patients in our study had left-sided disease, which is consistent with the findings of other studies, including the one by Meshram et al. [13,14]. Nevertheless, a detailed explanation for this phenomenon remains elusive. In accordance with prior research [14, 15], our study identified infiltrating ductal carcinoma (NOS) as the most prevalent histological subtype. In the Western population, a greater proportion of patients are diagnosed at an early stage, which is likely attributable to a combination of factors including higher social and economic status, greater awareness, the implementation of screening programs, and improved access to healthcare services. However, studies

from the Indian cohort indicate that the majority of patients present with advanced-stage disease. Patients from India frequently lack information and are disinclined to disclose and seek medical attention for asymptomatic breast masses. Additionally, our study demonstrated that the majority of patients presented with stage III disease, a finding that is consistent with other studies from our country, as illustrated in **Table 3** [10, 18-20]. Among patients with stage IV disease, the most frequent site of metastasis was the bone in 40.7% of cases. This pattern of metastasis is also corroborated by various other studies, including those by Upadhyay et al. [20], which reported skeletal metastasis in 40.9% of cases, and Gogia et al., which reported a similar figure of 48.5% [17]. The majority of patients in our study were classified as grade 2 (59.3%), which is consistent with the findings of other studies from North India regarding the hormone receptor status, which is an important prognostic and predictive marker. Almost half of the patients were HR+, which is consistent with the findings of numerous Indian studies that have reported HR-positive status in a range of 48% to 63% (21, 22). A further South Indian study also indicates that 52% of cases are ER positive. In this study, 24.8% of cases exhibited positivity, a figure comparable to that observed in various Indian studies, which reported a prevalence of 14.7 to 29% for HER-2 positive status [17, 23]. It is noteworthy that Vaidyanathan et al. reported a her2 positive status of 40.2% in South India [24]. An increased proportion of TNBC in India is another factor that has been attributed to a younger age at diagnosis in the Indian population, as reported in various Indian studies. In our research, we observed a prevalence of 21.9% for TNBC, which is higher than the 11.2% reported by Dent et al. [25]. It should be noted that this study is subject to certain limitations, namely that it is a retrospective study based on data from a single government tertiary cancer care center. Those with greater financial resources tend to seek care from corporate hospitals at an early stage of the disease. It was not possible to collect complete data for all patients. The study did not include an analysis of risk factors, treatment, or survival. The present study illuminates the current state of breast cancer patients in South India. The median age at which patients presented was 49 years, and the majority of patients were postmenopausal. A considerable number of patients present with advanced disease, resulting in stage III being the most common presentation. Additionally, there has been an observed

increase in the number of patients with hormone receptor-positive tumors, indicating a need for greater availability of agents in hormonal therapy. A greater proportion of patients present with metastatic disease, including skeletal metastasis. Therefore, the necessity for bone-directed therapy is heightened. It is imperative to enhance awareness about breast cancer in India, assuage concerns, and disseminate information about the significance of screening, prompt diagnosis, and treatment. It would be beneficial to provide patients with a contact in case of any concerns regarding a suspicious lump. It is recommended that further studies be conducted in order to establish a baseline for the extent of the problem and to facilitate the development of potential solutions.

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Authors' Contribution

AC, SBMC and LKN contributed to the conception of the study. SBMC, LKN, AHR, TB and AC were responsible for the acquisition. AC, LAJ, SBMC, LKN, AHR, LKR, SAB, and TB drafted the work. LKN, AHR and LKR substantively revised it. All authors have read and approved the manuscript.

Ethics

A request for exemption from review was submitted to the Institutional Ethics Committee of the Kidwai Memorial Institute of Oncology in Bangalore. All personal data were kept strictly confidential. As this was a record-based study, the requirement for informed consent was waived.

Conflict of Interest

The authors declare that they have no conflict of study.

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This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sector.

Data Availability

The data that support the findings of this study are available on request from the corresponding author.

Table 3. Comparison of Stage with other Indian studies

| Author | Present study | Upadhyay et al. [18]. | Rathod et al. [19]. | Shah et al. [20]. | Bhat et al. [10]. |
|----------------------------|---------------|-----------------------|---------------------|--------------------|-------------------|
| Year of Publication | | 2023 | 2021 | 2021 | 2019 |
| Region | South India | East India | East India | West India | North India |
| Stage I | 1.2% | 2.8% | 1.8% | Localized 20.4% | 10 |
| Stage II | 29.2% | 28.7% | 44.5% | | 49 |
| Stage III | 46.8% | 48% | 44.5% | Locoregional 62.1% | 30 |
| Stage IV | 22.8% | 21% | 8.7% | 17.6% | 11 |

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