

Types of Treatment and Early Clinical Outcomes in Breast Cancer Patients: A Retrospective Cohort Study

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ABSTRACT

Introduction: Breast cancer is the most commonly diagnosed malignancy among women worldwide and remains a major contributor to cancer-related mortality, particularly in low- and middle-income countries. However, data describing stage distribution, treatment delivery, radiotherapy utilisation, and early clinical outcomes of breast cancer patients treated in public-sector tertiary care institutions remain limited.

Aim: To describe the clinicodemographic profile and treatment patterns of breast cancer patients managed at a tertiary care centre.

Materials and Methods: This retrospective cohort study was conducted at the Department of Radiotherapy, Midnapore Medical College, West Bengal, India. The present study included 152 histologically confirmed breast cancer patients managed between January 2023 and June 2025 and followed up till 31st December 2025. Patients with newly diagnosed metastatic disease at presentation were included. Data regarding age, residence, socioeconomic status, presenting symptoms, tumour characteristics, stage at diagnosis, type of surgery, systemic therapy, radiotherapy utilisation, duration of hospitalisation, and early clinical outcomes during follow-up were extracted from hospital records and analysed. Associations between categorical variables were assessed using the Chi-square test. Fisher's-exact test was used when expected cell frequencies were

small. The Chi-square test was used to evaluate associations between disease stage and duration of hospitalisation, type of surgery and radiotherapy utilisation, and disease stage and radiotherapy utilisation. Age and duration of hospitalisation were analysed as continuous variables where appropriate and were additionally categorised for descriptive and categorical analyses. No multivariable analysis was performed because the study was primarily descriptive and exploratory, and the sample size and number of outcome events were limited. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) software, version 24.0. A two-sided p-value <0.05 was considered statistically significant.

Results: Breast cancer constituted 31.8% of all cancer registrations. Majority were aged ≤50 years and from lower socioeconomic strata. Stage-II disease was most common. Adjuvant radiotherapy was administered in 85% of patients. A significant association was observed between disease stage and hospital stay ($p<0.001$), type of surgery and radiotherapy utilisation ($p<0.001$), and radiotherapy utilisation with disease stage ($p<0.001$).

Conclusion: Advanced-stage disease remains prevalent and is associated with increased healthcare utilisation. Integration of radiotherapy and early detection strategies are essential to improve outcomes.

Keywords: Breast neoplasms, Healthcare utilisation, Real-world evidence, Recurrence, Tertiary care, Treatment patterns

INTRODUCTION

Breast cancer continues to represent the most commonly diagnosed malignancy among women worldwide and remains a major contributor to cancer-related mortality [1]. Recent global estimates highlight a steady rise in incidence, particularly across low- and middle-income countries, where healthcare disparities continue to influence outcomes [2]. In the Indian context, breast cancer has emerged as the leading cancer among women, with an increasing proportion of cases being diagnosed at a relatively younger age [3]. Multiple factors, including limited awareness, absence of structured screening programs, and socioeconomic constraints, contribute to delayed diagnosis and a higher likelihood of advanced-stage presentation [4].

Differences in healthcare accessibility and availability of multidisciplinary oncology services further impact treatment patterns and overall outcomes across regions [5]. Evaluating institutional data through real-world audits is therefore essential to understand prevailing practice patterns and to identify potential gaps in cancer care delivery [6]. Breast cancer management requires an integrated multidisciplinary approach involving surgery, systemic therapy, and radiotherapy. Radiotherapy is an important component of locoregional management and is routinely considered after

breast-conserving surgery. After mastectomy, postmastectomy radiotherapy is guided by factors including tumour size, nodal involvement, margin status, and other clinicopathological risk features. Regional nodal irradiation may be considered in selected patients according to disease burden and risk profile. In metastatic disease, radiotherapy may be used for palliation of symptoms or local control in selected clinical situations [7,8]. Evaluation of early clinical outcomes, including recurrence and metastatic progression, provides an initial assessment of disease control in a real-world cohort, although longer follow-up is required to determine definitive survival outcomes.

Despite advances in multidisciplinary breast cancer management, real-world variation in stage at diagnosis, treatment delivery, radiotherapy utilisation, and early disease outcomes remains relevant in public-sector tertiary care settings. Institutional audits may help identify prevailing patterns of care, healthcare utilisation, and areas where improvements in early diagnosis and treatment delivery may be required. Therefore, the present study was undertaken to evaluate the clinicodemographic and disease characteristics, treatment patterns including surgery, systemic therapy and radiotherapy utilisation, duration of hospitalisation, and early clinical outcomes among breast cancer patients managed at a tertiary care centre.

The primary objective of the present study was to describe the clinicodemographic profile and treatment patterns of breast cancer patients managed at the study centre. Secondary objectives were to evaluate radiotherapy utilisation, assess the association between disease stage and duration of hospitalisation, examine the relationship between type of surgery and radiotherapy utilisation, and describe early clinical outcomes during follow-up.

MATERIALS AND METHODS

The present retrospective cohort study was conducted at the Department of Radiotherapy, Midnapore Medical College, West Bengal, India. This study included 152 histologically confirmed breast cancer patients managed between January 2023 and June 2025 and followed up till 31st December 2025. The study was approved by the Institutional Ethics Committee (IEC No. IEC/2024/12).

Inclusion and Exclusion criteria: Patients were included if they had histologically confirmed breast carcinoma, were registered and managed at the study centre during the study period, and had adequate baseline clinical and treatment documentation. Patients with incomplete baseline records, insufficient documentation of treatment details, or no available follow-up information were excluded. Male breast cancer cases were excluded from the present analysis.

Follow-up was defined as the interval between the date of registration and the date of last documented clinical contact. The duration of available follow-up ranged from 6 to 36 months, reflecting the staggered dates of patient registration. The maximum follow-up duration of 36 months applied to patients registered earlier in the study period, while patients registered later had shorter follow-up durations.

Sample size calculation: Sample size estimation was performed to ensure adequate representation of the institutional breast cancer burden and sufficient precision for descriptive analysis. Based on institutional cancer registry data, breast cancer constituted approximately 31-32% of all malignancies registered during the study period. For the purpose of sample size calculation, a conservative prevalence estimate of 31.8% was adopted.

The sample size was calculated using the standard formula for single-proportion estimation:

$$n = (Z^2 \times p \times q) / d^2$$

Where:

- n =required sample size
- Z =standard normal deviate at 95% confidence level (1.96)
- p =anticipated prevalence (0.318)
- $q=1-p$
- d =absolute precision (0.075)

Substituting these values, the minimum required sample size was calculated to be 146 patients. The final cohort consisted of all eligible patients meeting the predefined inclusion criteria during the study period. Although the calculated minimum sample size was 146, the final analysed sample comprised 152 eligible patients identified during the study period. No arbitrary post hoc inflation of the sample size was performed.

Study Procedure

The following variables were extracted from hospital records: age at diagnosis, residence, socioeconomic status, presenting symptoms, laterality, tumour location, histopathological diagnosis, disease stage, type of surgery, use of neoadjuvant chemotherapy, adjuvant systemic therapy where documented, endocrine therapy where applicable, radiotherapy utilisation and intent, duration of hospitalisation, and follow-up outcomes including local recurrence and distant metastatic progression.

Hospital stay stratification: Hospital stay was categorised into two groups:

- ≤ 14 days
- > 14 days

For exploratory analysis, hospitalisation duration was categorised as ≤ 14 days and > 14 days based on the distribution of hospitalisation duration in the study cohort.

STATISTICAL ANALYSIS

Categorical variables were summarised as frequencies and percentages. Continuous variables were summarised using mean $\pm$ standard deviation for normally distributed data and median with interquartile range or range for non normally distributed data. Associations between categorical variables were assessed using the Chi-square test. Fisher's-exact test was used when expected cell frequencies were small. The Chi-square test was used to evaluate associations between disease stage and duration of hospitalisation, type of surgery and radiotherapy utilisation, and disease stage and radiotherapy utilisation. Age and duration of hospitalisation were analysed as continuous variables where appropriate and were additionally categorised for descriptive and categorical analyses. No multivariable analysis was performed because the study was primarily descriptive and exploratory, and the sample size and number of outcome events were limited. Statistical analyses were performed using SPSS software, version 24.0. A two-sided p-value < 0.05 was considered statistically significant.

RESULTS

Clinico-pathological Profile

Of the 152 patients, 92 (60.5%) were aged ≤ 50 years, while 60 (39.5%) were aged > 50 years. A total of 98 patients (64.5%) were from rural or semi-urban areas, while 54 (35.5%) were from urban areas. Regarding socioeconomic status, 82 patients (53.9%) belonged to the low socioeconomic group, 60 (39.5%) to the middle socioeconomic group, and 10 (6.6%) to the high socioeconomic group. Breast lump was the most common presenting symptom, reported by 150 (98.6%) patients. Pain associated with the breast lump was reported by 85 (55.9%) patients, while palpable axillary lymphadenopathy was documented in 78 (51.3%) patients. Other presenting symptoms and clinical characteristics are summarised in [Table/Fig-1]. At presentation, 10 (6.6%) patients had Stage-I disease, 70 (46.1%) had Stage-II disease, 52 (34.2%) had Stage-III disease, and 20 (13.1%) had Stage-IV disease [Table/Fig-2,3]. Laterality analysis showed a marginal predominance of right-sided breast involvement compared to the left {Right-sided 87 (57.23%

Variables	n (%)
Age	
≤ 50 years	92 (60.5)
> 50 years	60 (39.5)
Residence	
Rural/Semi-urban	98 (64.5)
Urban	54 (35.5)
Socioeconomic status	
Low SES	82 (53.9)
Middle SES	60 (39.5)
High SES	10 (6.6)
Presenting symptoms	
Breast lump	150 (98.6)
Pain	85 (55.9)
Axillary nodes	78 (51.3)

[Table/Fig-1]: Patients' demographic data.
SES: Socioeconomic status.

Variables		n (%)
Stage at presentation	Stage-I	10 (6.6)
	Stage-II	70 (46.1)
	Stage-III	52 (34.2)
	Stage-IV	20 (13.2)
Surgery type	MRM	88 (57.9)
	BCS	64 (42.1)
Neoadjuvant chemo	NACT	86 (56.6)
Radiotherapy	Adjuvant RT	129 (84.9)
	Palliative RT	15 (9.9)
	No RT	8 (5.3)
Hospital stay	≤14 days	95 (62.5)
	>14 days	57 (37.5)

[Table/Fig-2]: Treatment characteristics of the cases.

BCS: Breast-conserving surgery; MRM: Modified radical mastectomy; NACT: Neoadjuvant chemotherapy; RT: Radiotherapy; SES: Socioeconomic status.

Stage	≤14 days	>14 days	Total	p-value
Early	40	5	45	<0.001
Locally advanced	45	30	75	
Metastatic	10	22	32	
Total	95	57	152	

[Table/Fig-3]: Association between stage and hospital stay.

and left-sided cases were 65 (42.76%)) while bilateral disease was uncommon. Quadrant-wise distribution revealed that lesions most frequently involved the upper outer quadrant (40%), followed by the lower outer quadrant (35%), consistent with known breast tissue distribution patterns.

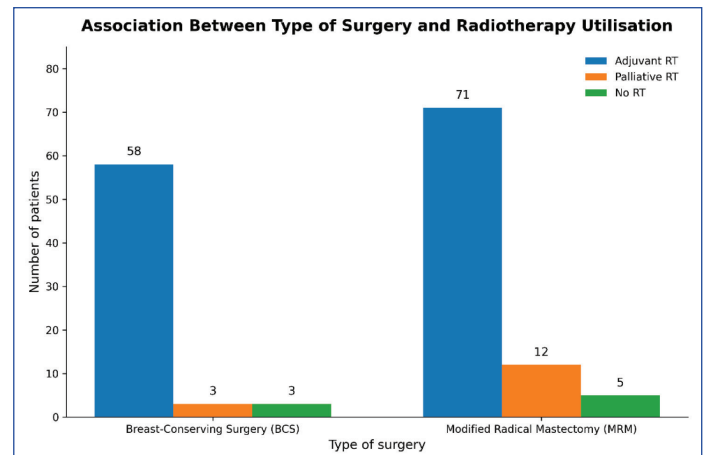
Histopathological examination demonstrated that invasive ductal carcinoma was the predominant histological subtype, accounting for the vast majority of cases. Other histological variants, including ductal carcinoma in situ and less common subtypes, comprised a minority of cases.

Neoadjuvant chemotherapy was administered to 86 (56.6%) patients. Surgical intervention formed a key component of treatment for operable patients. Modified radical mastectomy was the most frequently performed surgical procedure, reflecting the advanced stage at presentation and limited suitability for breast conservation in a proportion of patients. Regarding surgical treatment, 88 (57.9%) patients underwent modified radical mastectomy, while 64 (42.1%) underwent breast-conserving surgery. Radiotherapy was administered to 144 (94.7%) patients. Of these, 129 (84.9% of the total cohort) received adjuvant radiotherapy and 15 (9.8%) received palliative radiotherapy. A total of 8 patients (5.3%) did not receive radiotherapy.

The duration of hospitalisation was ≤14 days in 95 (62.5%) patients and >14 days in 57 (37.5%) patients. A statistically significant association was observed between disease stage and duration of hospitalisation ($p < 0.001$). Among patients with early disease, 40/45 (88.9%) had a hospital stay of ≤14 days and 5/45 (11.1%) had a stay of >14 days. Among patients with locally advanced disease, 45/75 (60.0%) had a stay of ≤14 days and 30/75 (40.0%) had a stay of >14 days. Among patients with metastatic disease, 10/32 (31.3%) had a stay of ≤14 days and 22/32 (68.8%) had a stay of >14 days [Table/Fig-3]. A significant association was observed between disease stage and duration of hospitalisation ($\chi^2 = 26.90$, $df = 2$, 95% CI: 0.252–0.573, $p < 0.001$).

Radiotherapy utilisation differed significantly according to the type of surgery ($p < 0.001$). [Table/Fig-4].

Among patients undergoing breast-conserving surgery, 58/64 (90.6%) received adjuvant radiotherapy, 3/64 (4.7%) received palliative



[Table/Fig-4]: Bar diagram showing distribution of radiotherapy utilisation according to surgery type.

radiotherapy, and 3/64 (4.7%) did not receive radiotherapy. Among patients undergoing modified radical mastectomy, 71/88 (80.7%) received adjuvant radiotherapy, 12/88 (13.6%) received palliative radiotherapy, and 5/88 (5.7%) did not receive radiotherapy.

Radiotherapy utilisation also differed significantly according to disease stage ($p < 0.001$). Among patients with early-stage disease, 40/45 (88.9%) received adjuvant radiotherapy, 2/45 (4.4%) received palliative radiotherapy, and 3/45 (6.7%) did not receive radiotherapy [Table/Fig-5]. Among patients with locally advanced disease, 70/75 (93.3%) received adjuvant radiotherapy and 5/75 (6.7%) received palliative radiotherapy. Among patients classified as metastatic/oligometastatic, 19 (59.4%) received postoperative/local-control radiotherapy as part of an individualised multimodality treatment strategy, while 8 (25.0%) received palliative radiotherapy and 5 (15.6%) did not receive radiotherapy.

Stage	Postoperative/local – control RT	Palliative	None	Total	p-value
Early	40	2	3	45	<0.001
Locally advanced	70	5	0	75	
Metastatic	19	8	5	32	
Total	129	15	8	152	

[Table/Fig-5]: Distribution of radiotherapy intent according to disease stage.

A statistically significant association was observed between disease stage and radiotherapy intent ($\chi^2 = 23.36$, $df = 4$, 95% CI: 0.198–0.529 $p < 0.001$).

The median duration of follow-up was 19 months (range: 6–36 months). During follow-up, 3 patients (2.0%) developed local recurrence, at a median interval of approximately 12 months. Distant metastatic progression was documented in 15 patients (9.9%), occurring at a median interval of approximately 18 months.

DISCUSSION

Breast cancer continues to be a major oncological burden in developing countries, with increasing incidence and shifting demographic patterns [9]. The present study demonstrates that nearly one-third of all cancer registrations at the study Institution during the study period were attributable to breast malignancy, reinforcing its status as the most common cancer among women in the Indian setting. Adequate follow-up duration is a critical determinant of interpretability in oncological outcome studies. In the current cohort, the median follow-up duration of 19 months, calculated using the reverse Kaplan-Meier method, provides sufficient temporal depth to assess early treatment-related outcomes and healthcare utilisation patterns. The wide follow-up range reflects staggered recruitment and mirrors real-world clinical practice in public-sector hospitals. The predominance of younger patients in this study reflects trends reported in Asian populations [10]. The high proportion of patients from lower

socioeconomic strata highlights disparities in healthcare access and awareness, contributing to delayed presentation [11]. This is reflected in the predominance of Stage-II and III disease at diagnosis [12]. The inclusion of radiotherapy utilisation in this study provides a comprehensive overview of multimodality care. The high utilisation of adjuvant radiotherapy indicates adherence to standard treatment protocols [13].

A significant association between advanced stage and prolonged hospital stay underscores the increased healthcare burden associated with late presentation [14]. Hospital stays duration serves as a pragmatic surrogate marker for disease burden, treatment complexity, and peri-treatment morbidity. In this study, the majority of patients experienced hospitalisation of 14 days or less, suggesting effective perioperative management and streamlined treatment delivery in early and intermediate-stage disease. Shorter hospital stay was typically associated with uncomplicated surgical recovery, timely initiation of adjuvant therapy, and satisfactory baseline performance status. Conversely, prolonged hospitalisation beyond 14 days was more frequently observed among patients presenting with advanced or metastatic disease, those experiencing postoperative wound complications, or individuals developing treatment-related toxicities such as febrile neutropenia, severe mucositis, or gastrointestinal intolerance. Poor nutritional status, anaemia, and comorbid illnesses further contributed to extended inpatient care in this subgroup.

The treatment patterns observed in the present study are broadly consistent with the heterogeneity reported in previous real-world studies. In a rural cancer centre in Western India, Nene BM et al., reported a predominance of modified radical mastectomy, which was performed in 91% of patients, and identified challenges related to treatment completion and follow-up [6]. In comparison, breast-conserving surgery was performed in 42.1% of patients in the present cohort, while 57.9% underwent modified radical mastectomy. This difference may reflect variations in stage distribution, patient selection, institutional practice, and access to multidisciplinary breast cancer care. At the international level, the VENUSCANCER project demonstrated substantial variation in stage at diagnosis and delivery of guideline-concordant treatment, particularly surgery and radiotherapy, across 39 countries and territories [15]. These findings support the importance of interpreting institutional patterns of care within the context of local healthcare infrastructure, referral pathways, and resource availability.

The association between breast-conserving surgery and radiotherapy further supports adherence to established treatment guidelines [16]. From a public health perspective, improving early detection could significantly reduce advanced-stage presentation and associated treatment burden [17]. Access to radiotherapy services remains a key determinant of outcomes in resource-limited settings [18]. Persistent disparities in stage at diagnosis suggest that awareness and screening efforts require strengthening [19]. Future studies incorporating longer follow-up and molecular subtype-based analyses may provide further insight into disease outcomes and treatment patterns, as supported by previous literature [20,21]. Multidisciplinary care remains essential for optimising treatment outcomes [22].

Limitation(s)

The present study has several limitations. Its retrospective, single-centre design limits generalisability to other healthcare settings. The duration of available follow-up was variable and relatively short for patients recruited later in the study period, limiting assessment of long-term outcomes. Molecular subtype and hormone receptor/ Human Epidermal growth factor Receptor 2 (HER2) status were not consistently available for analysis. In addition, formal survival analysis was not included in the original study objectives, and the available follow-up was insufficient for robust assessment of long-

term survival outcomes. The study was also primarily descriptive and was not designed to establish causal relationships between disease stage, treatment patterns, and healthcare utilisation.

CONCLUSION(S)

Breast cancer represented a substantial institutional cancer burden, with Stage-II and Stage-III disease accounting for a considerable proportion of presentations. Advanced disease was associated with longer hospitalisation and greater healthcare utilisation in this cohort. Radiotherapy was integrated into multimodality treatment across disease stages, with treatment intent varying according to clinical context. These findings underscore the importance of early diagnosis, timely access to multidisciplinary treatment, and continued evaluation of breast cancer care delivery in public-sector tertiary hospitals. Longer follow-up and prospective multicentre studies are required to better assess long-term clinical outcomes.

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