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Original Research Article

A Retrospective Study of Chemotherapy Response and Survival Outcomes Among Patients with Breast Cancer

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Abstract:

Background: Breast cancer is still a significant health issue and chemotherapy is an important part of its treatment. But the outcome for treatment and survival is different depending on the stage of the tumour, the molecular subtype and the factors associated with the treatment.

Aim: The aim of the research is to conduct a retrospective analysis of the treatment response and survival rate among breast cancer patients and identify the factors influencing these indicators.

Methodology: This is a retrospective study based on patient charts belonging to 120 patients undergoing breast cancer treatment at the Medical Oncology Department of Patna Medical College & Hospital, Patna, Bihar, India. The following demographic details, stage of tumor, type of molecular subtype, regimen of chemotherapy, response to therapy and follow-up details were studied. All statistical data were analyzed using SPSS software and descriptive and Chi-square test were performed.

Results: Patients were most commonly in the age group 41–50 years (35%) and the majority had Stage III disease (40%). 40% received the AC-T regimen and 80% finished their chemotherapy. The objective response rate was 55% (partial response in 40% and complete response in 15%). There was a strong correlation between stage of cancer and response to treatment ($p = 0.001$). The overall survival was estimated at 82.5% at 12 months, and the progression-free survival was estimated at 64.2%.

Conclusion: The findings reveal differences in the chemotherapy response and the survival rates based on stage of the disease and chemotherapy completion. Early diagnosis coupled with appropriate chemotherapy selection and frequent monitoring could help in managing breast cancers.

Keywords: Breast Cancer, Chemotherapy, Treatment Response, Overall Survival, Progression-Free Survival, Retrospective Study.

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Introduction

Breast cancer is a common type of cancer that is affecting many women and it is a public health issue because of the rising cases, morbidity, and mortality [1]. It transpires when atypical cells in the breast proliferate uncontrollably, forming a malignant tumour that can encroach onto adjacent tissues and disseminate to other regions of the body. Determinants influencing breast cancer encompass age, genetic predisposition, hormonal influences, familial background, reproductive elements, and lifestyle-associated factors [2]. Despite significant advancements in early diagnosis and treatment methods, breast cancer continues to be a leading contributor to the global cancer burden, making effective treatment strategies and patient outcomes essential.

Chemotherapy plays a crucial role in the treatment of breast cancer, particularly for patients with locally advanced, high-risk, or metastatic forms of the disease [3]. It encompasses the administration of anti-neoplastic agents that eradicate cancerous cells or inhibit their proliferation and growth. The chemotherapy can be used as neoadjuvant (before surgery), adjuvant (after surgery), or as a primary treatment in advanced disease [4]. Chemotherapy drugs are chosen based on a number of clinical and pathological factors such as tumour stage, histological type, hormone receptor status, the expression of the HER2 receptor, patient's age and overall health status. The main aims of chemotherapy are to shrink the tumour, manage the spread of the disease, avoid recurrence and enhance general survival rate.

Important breast cancer management is evaluation of treatment response to assess the efficacy of chemotherapy and help inform clinical decision-making [5]. Evaluation of the treatment response can be done by the changes in tumour size, clinical examination, radiological investigations, pathological findings or disease progression. Following chemotherapy, patients may experience one of four probable outcomes: stable disease, increasing disease, partial remission, or complete remission. Treatment outcomes, however, vary from person to person because to variations in cancer biology and molecular features, disease stage, chemotherapy type, duration of treatment, and patient response [6]. Hormone receptor expression, HER2 expression, and triple-negative breast cancer are other important factors that affect treatment sensitivity and prognosis.

Another important indicator of how well breast cancer treatments are working is survival. Prognosis and long-term therapy effectiveness are assessed using a number of clinical endpoints, including overall survival (OS), progression-free survival (PFS), and disease-free survival (DFS) [7]. PFS refers to the duration in which the condition does not become worse, while overall survival refers to the duration between the initial diagnosis or treatment of the disease until the patient dies of any cause. The length of time a patient stays free of cancer after therapy is a good indicator of disease-free survival [8]. The results offer important clues to the link between response to treatment and disease features and long-term outcomes.

Retrospective analysis offers a chance to review past clinical data and to see how patients with BC treated with chemotherapy fared in terms of treatment patterns and survival. Researchers can find important trends in the response to treatment and progression of disease by examining the clinical histories, diagnostic reports, treatment and follow-up information in hospital records [9]. This type of analysis can also be used to assess the impact of demographic and clinical factors, such as age, cancer stage, tumour type, type of chemotherapy and whether or not patients completed treatment, on patient survival. Retrospective studies have special value to elucidate treatment efficacy in the real world and factors that influence good or bad outcomes.

Despite advancements in diagnosis, chemotherapy, and supportive care (including pain management, patient information, and support), there is still a great deal of diversity in how women with breast cancer respond to treatment and survive. Clinical results can vary depending on the stage of diagnosis, molecular features, therapy tolerance, comorbidities, and availability of adequate medical care [10]. Therefore, it is crucial to look at both survival and treatment response in order to better understand how successful chemotherapy is in the actual world. This data can improve risk assessment, treatment planning, and patient care.

The purpose of this study is to evaluate the survival rates of individuals diagnosed with breast cancer with their clinical response to chemotherapy. It is a study of the demographic and clinical features, patterns of chemotherapy treatment, response to chemotherapy and survival markers from previously collected patient data. The study also aims to determine factors that are associated with the treatment success/failure and survival rates, allowing for better understanding of real-world chemotherapy response and helping to enhance clinical decisions and breast cancer care.

Methodology

This study was conducted in order to determine the survival rate and the treatment response of breast cancer patients who underwent chemotherapy. Demographic characteristics, clinical profile, chemotherapy treatment patterns, treatment response and survival outcomes were assessed based on an analysis of previously available hospital records. The total patients included in the study were 120 and the clinical data were collected from the clinical records maintained by the department of Medical Oncology, Patna Medical College, Patna, Bihar, India.

Study Design: The study has a retrospective observational design. The treatment response and survival rate of individuals with previously reported breast cancer who received chemotherapy were assessed using their medical records. Furthermore, the association between treatment outcome and several clinical and demographic characteristics was examined.

Study Area: The study was done in the department of Medical Oncology, Patna Medical College and Hospital, Patna, Bihar, India.

Study Duration: The research was carried out over a period of one year from January 2025 to December 2025.

Study Participants: The study comprised of 120 patients with breast cancer who had undergone chemotherapy in the selected hospital. Medical records were reviewed for patient information, such as demographics, clinical characteristics, tumour stage, treatment regimen, response and follow-up status.

Inclusion Criteria

- Patients who have been histopathologically confirmed with breast cancer.
- At the selected hospital, patients who were treated with at least one cycle of chemotherapy.
- Patients 18 years of age and older.

- Patients with clinical records and chemotherapy information documented.
- Patients with available treatment response and follow-up information.
- Patients with enough information in their medical records to assess outcomes.

Exclusion Criteria

- Patients who have received a diagnosis of breast cancer, but are not confirmed.
- Patients who were not treated with chemotherapy.
- Patients who do not have complete or missing essential medical records.
- Patients treated only at another health care institution.
- Patients who do not have enough information on what happened to them following the treatment and/or whether or not they are alive.
- Patients with other primary malignancies that have been diagnosed and will be treated separately (e.g., prostate, lung, or brain cancer).

Sample Size: There were 120 breast cancer patients in all. The sample size was deemed suitable for assessing treatment response and survival during the study period. A purposive sampling technique was used to identify eligible patients, based on the availability of medical records and the completeness of the patient's records.

Procedure: Relevant information was extracted from previously maintained hospital records, oncology registers, chemotherapy documentation and follow-up records. Collected variables were age, gender, clinical presentation, histopathological results, tumour stage, molecular subtype, chemotherapy type, chemotherapy cycle number and chemotherapy completion status. Patients' treatment response was divided into four categories based on recorded clinical and radiologic evaluation using RECIST criteria, if applicable: complete response, partial response, stable disease, and progressing disease. Overall survival and progression-free survival were reported using available follow-up data. Patients' survival status and dates of disease progression or death were recorded wherever available. The data that had been extracted was systematically arranged and patient confidentiality was ensured for statistical analysis.

Statistical Analysis: Statistical Package for the Social Sciences (SPSS) was applied for the entry, arrangement, and analysis of the data. Descriptive statistics such as frequency, percentage, mean, and SD were used to illustrate the clinical and demographic characteristics. Categorical variables with treatment outcome were subjected to Chi-square test. Estimation of overall survival and progression free survival was done using Kaplan Meier survival analysis and Log-rank test was used to analyze the survival distribution among the relevant patient's groups. Cox proportional hazard regression analysis was used to determine variables that are associated with survival outcomes. Statistical significance was set at $p<0.05$.

Results

The purpose of assessing the clinicodemographic characteristics, treatment practices for chemotherapy, treatment responses and survival in a total of 120 breast cancer patients, the findings of the retrospective study were analyzed. By employing the method of descriptive statistics and inferential statistics such as frequencies, percentages, Chi-square test and Kaplan-Meier survival analysis, the treatment efficacy and the survival-related factors of the patients were assessed.

Table 1 displayed demographic information on the study participants, including age groupings and the percentage of males and females. The frequency and percentages of the patients for each demographic group were displayed in a table that summarised the data. According to Table 1, the age group with the largest percentage of patients was 41–50 years old (35.0%), followed by 51–60 years old (25.0%), 31–40 years old (20.0%), above 60 years old (13.3%), and 18–30 years old (6.7%). 96.7% of the patients were female, compared to 3.3% who were male. According to the findings, patients between the ages of 41 and 50 had a high prevalence of breast cancer, and female patients were more likely to have the disease.

Table 1: Distribution of Patients According to Demographic Characteristics (N = 120)

Demographic characteristics	Frequency (n)	Percentage (%)
Age group (years)		
18–30	8	6.7
31–40	24	20.0
41–50	42	35.0
51–60	30	25.0
Above 60	16	13.3
Gender		
Female	116	96.7
Male	4	3.3
Total	120	100.0

Table 2 presented information concerning the clinical and tumor characteristics of the breast cancer patients. The table provided data concerning the distribution of breast cancer patients according to different stages of breast cancer and molecular subtypes and percentage. According to Table 2, the most frequent type of breast cancer was stage three (40.0%), followed by stage two (30.0%), stage four (23.3%) and stage one (6.7%). As far as the molecular subtypes are concerned, Luminal A and HER2 positive breast cancer constituted 20.0%, while Luminal B and triple negative breast cancer made up 30.0%. The results indicate that many patients suffered from late-stage breast cancer and among the subtypes the most frequent ones were Luminal B and triple-negative.

Table 2: Distribution of Patients According to Clinical and Tumour Characteristics (N = 120)		
Clinical characteristics	**Frequency (n)**	**Percentage (%)**
Stage of breast cancer		
Stage I	8	6.7
Stage II	36	30.0
Stage III	48	40.0
Stage IV	28	23.3
Molecular subtype		
Luminal A	24	20.0
Luminal B	36	30.0
HER2-positive	24	20.0
Triple-negative	36	30.0
Total	120	100.0

Table 3 provided a summary of the chemotherapy treatment regimens of the study's participants with breast cancer. It specified the different kinds of chemotherapy that were given, the amount of chemotherapy sessions given, and the number of completed sessions of chemotherapy. The most frequently used chemotherapy regimen was the AC-T (40.0%), followed by FAC (20.0%), TC (16.7%), HER2-targeted chemotherapy-based regimen (13.3%) and other regimens (10.0%), as shown in Table 3. As for the number of chemotherapy cycles, 60.0% of patients, had 4-6 cycles and 30.0% had more than 6 cycles. In addition, 80.0% of the patients received the intended treatment; while 20.0% did not. These results suggested that the most common chemotherapy treatment was AC-T and the majority of patients finished their chemotherapy courses.

Table 3: Distribution of Patients According to Chemotherapy Treatment Patterns (N = 120)		
Chemotherapy-related characteristics	**Frequency (n)**	**Percentage (%)**
Chemotherapy regimen		
AC-T regimen	48	40.0
FAC regimen	24	20.0
TC regimen	20	16.7
HER2-targeted chemotherapy-based regimen	16	13.3
Other regimens	12	10.0
Number of chemotherapy cycles		
1–3 cycles	12	10.0
4–6 cycles	72	60.0
More than 6 cycles	36	30.0
Treatment completion status		
Completed planned treatment	96	80.0
Did not complete planned treatment	24	20.0
Total	**120**	**100.0**

Breast cancer patients' treatment responses following chemotherapy were evaluated in Table 4. Patients were classified into four groups according to their reaction: stable disease, progressing disease, complete response, and partial response. This categorisation was based on clinical and radiological assessments. Complete response (15.0%), progressing disease (20.0%), stable disease (25.0%), and partial response (40.0%) are the most prevalent outcomes, as shown in Table 4. While 80.0% of those undergoing disease control had either a full recovery, a partial recovery, or stable disease, 55.0% of those undergoing objective response had an incomplete response. After treatment, more than half of the patients' tumour sizes shrank noticeably, while twenty percent had disease progression, according to the results.

Table 4: Assessment of Treatment Response Following Chemotherapy (N = 120)		
Treatment response	**Frequency (n)**	**Percentage (%)**
Complete response (CR)	18	15.0
Partial response (PR)	48	40.0
Stable disease (SD)	30	25.0
Progressive disease (PD)	24	20.0
Total	**120**	**100.0**

The results of the association between various stages of breast cancer with the effect of chemotherapy treatment response are presented in table 5. The proportion of patients with each type of response such as complete response, partial response, stable disease, and advancing disease for each level of cancer was considered. It can be seen from table 5 that partial responses were relatively common among patients with Stage II and Stage III breast cancer (18 and 20, respectively). The highest number of patients that had complete response was for Stage II (n = 8), while the highest number of patients that had progressive disease was for Stage IV (n = 13). Additionally, 46.4% of the stage IV patients had disease progression. The relationship between the breast cancer stage and the treatment response was statistically significant ($\chi^2 = 29.27$, p = 0.001), suggesting that the treatment response was significantly different at each stage of breast cancer.

Table 5: Association Between Cancer Stage and Treatment Response (N = 120)					
Cancer stage	**Complete response**	**Partial response**	**Stable disease**	**Progressive disease**	**Total**
Stage I	3	4	1	0	8
Stage II	8	18	7	3	36
Stage III	6	20	14	8	48
Stage IV	1	6	8	13	28
Total	18	48	30	24	120

Chi-square test: $\chi^2 = 29.27$, df = 9, p = 0.001.

The survival status of breast cancer patients of the period of follow-up that was available is shown in Table 6. It reported the number and percentage of patients who were alive at the last follow-up recorded and the number and percentage of deaths that were documented. The last follow-up group consisted of 99 patients (82.5%) who were alive and 21 patients (17.5%) who died during the follow-up period as presented in Table 6. According to these findings, the majority of patients were still living at the end of the follow-up period, while a small number of patients died following a diagnosis and course of treatment for breast cancer.

Table 6: Distribution of Patients According to Survival Status During Follow-up (N = 120)		
Survival status	**Frequency (n)**	**Percentage (%)**
Alive at last follow-up	99	82.5
Death recorded	21	17.5
Total	**120**	**100.0**

The survival outcomes of patients with breast cancer were presented using the Kaplan–Meier survival analysis, as indicated in Table 7. The median OS, median PFS, 12-month progression-free survival, and 12-month overall survival were also analyzed. As is apparent from Table 7, the rate of progression-free survival was 64.2%, and the 12-month overall survival was expected to be 82.5%. The median progression-free survival was estimated to be 14.2 months, and the median overall survival could not be achieved during observation. These findings suggested that while most of the patients survived during the follow-up, a significant number had disease progression during the time of observation.

Table 7: Kaplan–Meier Analysis of Survival Outcomes Among Breast Cancer Patients (N = 120)	
Survival parameter	**Estimated outcome**
Overall survival at 12 months	82.5%
Progression-free survival at 12 months	64.2%
Median overall survival	Not reached
Median progression-free survival	14.2 months

The Table 8 displayed the correlation between several clinical factors and the survival rate of the patients having breast cancer. It revealed the differences in survival rates, like the number of

patients being alive or dead after the completion of the follow up, of patients having different stages of the cancer and the recommended chemotherapy. Patients with Stage I–II breast cancer had a greater survival rate than those with Stage III–IV (Table 8). Likewise, there was an increased survival proportion among those who completed planned chemotherapy (87.5%) and those who failed to complete plan chemotherapy (62.5%). Patients that did not complete treatment (37.5%) and those with Stage III–IV (22.4%) had higher mortality proportions. These findings showed that, when compared to later diagnosis and planned chemotherapy, early detection and completion of planned chemotherapy had a more favorable prognosis. These associations needed to be statistically tested to prove their significance, however.

Table 8: Association Between Selected Clinical Characteristics and Overall Survival (N = 120)

Clinical characteristics	Alive n (%)	Death n (%)	Total
Cancer stage			
Stage I–II	40 (90.9)	4 (9.1)	44
Stage III–IV	59 (77.6)	17 (22.4)	76
Treatment completion			
Completed treatment	84 (87.5)	12 (12.5)	96
Did not complete treatment	15 (62.5)	9 (37.5)	24
Total	**99 (82.5)**	**21 (17.5)**	**120**

Discussion

The present study comprised of 120 patients diagnosed with breast cancer, with the maximum number of patients belonging to the age group 41-50 (35%). The most prevalent stage of disease was Stage III (40%) followed by Stage II (30%). Body composition was explored as an effect on early breast cancer outcomes by Deluche et al., (2018) [11], emphasising the importance of patient-related factors in prognosis. Likewise, Chen et al. (2016) [12] examined the pretreatment NLR as a predictor for neoadjuvant chemotherapy response. This research reinforces the need to take both patient and clinical factors into account for breast cancer outcomes.

In the present study, the proportion of patients showing a partial response was 40%, complete response was 15%, and the overall objective response rate was 55%. Ghafouri et al. (2022) [13] have examined the selection of chemotherapy schedule and outcomes in the case of early TNBC and found out that the stage of the disease and treatment regimen was one of the factors affecting the outcomes. Moreover, Guillo et al. (2018) [14] have found out that the initiation of trastuzumab therapy in the case of HER2 positive breast cancer was associated with the outcomes. These findings support the idea that in order to maximise therapeutic efficacy, the appropriate treatment must be chosen and administered at the appropriate time.

In the current study, 80% of all patients were able to finish their scheduled chemotherapy, while stage IV patients had a higher percentage of progressing disease (46.4%). The results of individuals with locally advanced breast cancer who underwent adjuvant radiation and neoadjuvant chemotherapy were examined by Klein et al. (2019) [15]. Mougalian et al. (2016) [16] investigated the long-term consequences of initial systemic chemotherapy in individuals with pathological full responses. Their research can provide a helpful baseline for analysing the relationship between therapy response, disease severity, and treatment outcome.

The overall survival rate at 12 months was 82.5%, whereas the progression-free survival rate was 64.2%. Ong et al. (2018) [17], examined the outcome of treatment and survival of patients with metaplastic breast cancer and found that they survived less well than those with non-metaplastic breast cancer. To assess the treatment landscape and efficacy of palbociclib and subsequent treatments in mBC, Xi et al. (2019) [18] analyzed treatment patterns. These studies indicate that interpreting the survival outcome in various breast cancer populations will need to take into account the tumour characteristics and treatment approach.

A significantly higher survival rate was recorded in subjects having Stages I and II (90.9%) than those having Stages III and IV (77.6%) in the current study. In the same way, patients who finished the programmed chemotherapy had a higher proportion of survival seen (87.5%) compared to those who did not finish the treatment (62.5%). Wang et al (2019) [19] looked at survival of stage IV breast cancer patients based on the location of metastases, and Xiao et al (2018) [20] studied risk factors and survival of breast cancer patients with lung metastases. Their studies confirm the significance of the extent of the disease and the nature of the metastases in establishing prognosis. Overall, the present findings highlight the importance of early diagnosis, completion of treatment and periodic follow-up in breast cancer management.

Conclusion

The current retrospective study evaluated the survival rates and treatment responsiveness of 120

patients with breast cancer who were treated at Patna Medical College and Hospital in Patna, Bihar. According to the findings, the most common chemotherapeutic used was AC-T (40%), whereas the most commonly diagnosed stage was Stage III (40%). 80% of the subjects completed the planned therapy, with an objective response rate of 55%, where 40% were partial response and 15% complete response. The cancer stage was also found to be substantially correlated with treatment response; patients with Stage IV disease were more likely to experience the progressing stage. After a year, the progression-free survival rate was assessed to be 64.2%, while the overall survival rate was 82.5%. Patients with Stage I–II disease or those who finished chemotherapy as part of their intended course of treatment were slightly more prevalent. The importance of early diagnosis, appropriate chemotherapy selection, treatment adherence, and routine monitoring in maximising breast cancer treatment is highlighted by this study. Overall, the study emphasises how important stage and other treatment-related parameters are when evaluating chemotherapy efficacy and patient prognosis.

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