Journal of Population Therapeutics & Clinical Pharmacology

**RESEARCH ARTICLE**
**DOI: 10.53555/jptcp.v31i8.7499**

# BREAST-CONSERVING SURGERY VERSUS MASTECTOMY FOR TREATMENT OF BREAST CANCER AFTER NEOADJUVANT CHEMOTHERAPY

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## ABSTRACT

**Background:** The choice between breast-conserving surgery and mastectomy after neoadjuvant chemotherapy is crucial. Historically, mastectomy was favored, but recent techniques emphasize breast-conserving surgery for similar outcomes. Due to the lack of local data, this study was undertaken to compare these approaches and provide region-specific insights on their effectiveness, aiming to fill the existing knowledge gap.

**Objective:** To compare recurrence and survival outcomes between breast conserving surgery (BCS) and mastectomy after neoadjuvant chemotherapy (NACT).

**Methods:** In this study, data of 200 women who had undergone NACT was reviewed. For comparison two equal groups were consisted for women who had received breast conserving surgery and mastectomy after NACT. Mean value between the groups were compared using independent sample t test whereas frequencies were compared using Chi Square test/Fisher's Exact test. Comparison of breast cancer specific survival was stratified for age, pre-chemotherapy staging and tumor size to address effect modifiers and post stratification chi-square test/Fisher's Exact test was applied. A p-value≤0.05 was taken as statistically significant.

**Results:** The mean age of patients in Group A was 43.13 ± 7.80 years, while in Group B it was 46.56 ± 8.09 years. The age difference between the two groups was not statistically significant (p-value = 0.468). Pre-chemotherapy staging revealed that 65% of participants were classified as Stage II, with 62% in Group A and 68% in Group B; this difference was not statistically significant (p-value = 0.529). For Stage III, 35% of participants were classified, with 38% in Group A and 32% in Group B, also showing no significant difference. Mean tumor size was 5.90 ± 2.98 cm across the study. Group A had a mean tumor size of 6.06 ± 2.85 cm, while Group B had 5.74 ± 3.12 cm, with no significant difference (p-value = 0.593). Tumors were categorized into 1-6 cm and 7-12 cm ranges; both groups had 53% of participants with tumors in the 1-6 cm range and 47% in the 7-12 cm range, showing no significant difference (p-value = 0.841). Out of 100 participants, 90 (90.0%) had positive BCSS, with 96.0% in Group A and 84.0% in Group B. This difference was statistically significant (p-value = 0.046). Despite Group A's superior BCSS rate, subgroup analyses did not achieve statistical significance due to small sample sizes.

**Conclusion:** In conclusion, the study reveals that breast-conserving surgery (Group A) leads to better breast cancer-specific survival (BCSS) rates compared to mastectomy (Group B). Patients in

Group A had a higher BCSS rate, suggesting that breast-conserving surgery may offer superior survival outcomes after neoadjuvant chemotherapy. Although subgroup analyses did not yield significant results due to the small sample sizes, the overall findings support the effectiveness of breast-conserving surgery in enhancing survival rates.

**Key Words:** Breast Cancer, Breast Cancer Specific Survival (BCSS), Breast Conserving Surgery, Mastectomy, Neoadjuvant Chemotherapy.

## Introduction

Breast cancer is a pressing global health issue, impacting individuals across all demographics, regardless of religion, race, ethnicity, or socioeconomic status.[1] As one of the most commonly diagnosed cancers and the fifth leading cause of cancer-related deaths, breast cancer represents a significant public health challenge. According to GLOBOCAN 2020 data, there are approximately 2.3 million new cases of breast cancer worldwide annually.[1,2] The World Health Organization (WHO) reports that 1.5 million women are diagnosed with breast cancer each year globally.[2] The incidence of breast cancer is rising rapidly in Asia, contributing significantly to the global disease burden. Pakistan, in particular, has the highest prevalence in Asia, with 1 in 9 women affected by breast cancer.[3] This increasing prevalence is linked to factors such as urbanization, aging populations, and sedentary lifestyles, which have exacerbated the incidence of breast cancer and driven up both individual and societal costs associated with treatment.[4,5]

Neoadjuvant chemotherapy has become a cornerstone in the management of breast cancer over recent decades. This preoperative treatment aims to downstage the disease, making it more feasible to perform breast-conserving surgery (BCS) rather than mastectomy.[5,6] By reducing the size of the tumor and addressing local and regional disease, neoadjuvant chemotherapy enhances the likelihood of successful BCS, which is especially beneficial for patients with initially large or locally advanced tumors. This approach not only improves the chances of breast conservation but also helps in assessing the tumor's response to therapy, guiding further treatment decisions.[7,8]

Breast-conserving surgery, often combined with postoperative radiotherapy, has become the gold standard for managing early-stage breast cancer. It offers survival outcomes comparable to those of mastectomy, while also providing advantages in terms of body image and lifestyle. The primary goals of BCS are to achieve complete tumor removal with clear surgical margins while preserving the breast's natural shape and appearance. This approach aligns with the growing emphasis on patient-centered care, focusing on both oncological efficacy and quality of life.[8,9] Some studies have demonstrated that BCS, followed by radiation therapy, can offer equivalent survival rates to mastectomy for early-stage breast cancer, making it a preferred option for many patients.[11-14] The current study, addressing the lack of local data, is crucial for providing region-specific insights and guiding treatment decisions in the local context.

## Methodology

This retrospective study was conducted a the Department of General Surgery, Bolan Medical Complex Hospital, Surgery Unit-II, Quetta for a period of two years 01-04-2022 to 31-03-2024. A total of 100 women meeting inclusion criteria were enrolled after taking informed written consents. Inclusion criteria was: 1) receipt of neoadjuvant chemotherapy (NACT) with either a large primary tumor or significant axillary lymph node burden; 2) breast cancer classified as cT1-3N0-2M0 or ypT0-2N0-2M0; and 4) availability of information on adjuvant treatments, including chemotherapy, radiotherapy and endocrine therapy. Exclusion criteria comprised: 1) breast-conserving surgery (BCS) performed without subsequent adjuvant radiotherapy; 2) mastectomy patients with proven ypN1-2 stage but no postmastectomy radiotherapy (PMRT); 3) relapse within 2 months. All the study related data was noted in predesigned proforma and data was analyzed using SPSS 26.0.

## Results

The mean age of patients in Group A was 43.13 ± 7.80 years, while Group B had a mean age of 46.56 ± 8.09 years. The difference in age between the two groups was not statistically significant (p-value = 0.468). Regarding pre-chemotherapy staging, 65% of the participants were classified as Stage II. In Group A, 62% were at Stage II, while 68% of Group B were at Stage II. The difference between the groups was not statistically significant (p-value = 0.529). For Stage III, 35% of the participants were classified, with 38% in Group A and 32% in Group B, though this difference was also not statistically significant. Tumor size had a mean of 5.90 ± 2.98 cm across the entire study sample. In Group A, the mean tumor size was 6.06 ± 2.85 cm, while Group B had a mean tumor size of 5.74 ± 3.12 cm. This difference was not statistically significant (p-value = 0.593). Tumors were categorized into two size ranges: 1-6 cm and 7-12 cm. In both groups, 53% of participants had tumors in the 1-6 cm range, and 47% had tumors in the 7-12 cm range, with no significant difference between the groups (p-value = 0.841) as given in Table 1. Out of the 100 participants, 90 (90.0%) had a positive BCSS, with 48 (96.0%) in Group A and 42 (84.0%) in Group B. This difference was statistically significant with a p-value of 0.046, indicating a higher BCSS rate in Group A compared to Group B as given in table 2. However, while stratifying BCSS between the groups on the basis of various sub groups, though group A maintained its supremacy, but due to quite higher survival rates in both the groups , statistical significance could not be achieved owing to small sample difference for stratification. Data is given in Table 3.

**Table-1 Demographics of the Study Sample**

| Characteristics | Study Sample n=100 | Group A n=50 | Group B n=50 | p-value |
|---|---|---|---|---|
| **Age (years)** | 47.13±7.80 | 46.56±8.09 | 47.70±7.52 | 0.468 * |
| • **30-45 years** | 41 (41.0%) | 22 (44.0%) | 19 (38.0%) | 0.542 ** |
| • **46-60 years** | 59 (59.0%) | 28 (56.0%) | 31 (62.0%) | |
| **Pre-chemotherapy Staging** | | | | |
| • **Stage II** | 65 (65.0%) | 31 (62.0%) | 34 (68.0%) | 0.529 ** |
| • **Stage III** | 35 (35.0%) | 19 (38.0%) | 16 (32.0%) | |
| **Tumor Size (cm)** | 5.90±2.98 | 6.06±2.85 | 5.74±3.12 | 0.593 * |
| • **1-6 cm** | 53 (53.0%) | 26 (52.0%) | 27 (54.0%) | 0.841 ** |
| • **7-12 cm** | 47 (47.0%) | 24 (48.0%) | 23 (46.0%) | |

Comparison between the groups: * Independent Sample ** Chi square test, taking p-value≤0.05 as significant

**Table-2 Comparison of Breast Cancer Specific Survival (BCSS) Rates between the Groups**

| BCSS | Study Sample n=100 | Group A n=50 | Group B n=50 | p-value |
|---|---|---|---|---|
| • **Yes** | 90 (90.0%) | 48 (96.0%) | 42 (84.0%) | 0.046 |
| • **No** | 10 (10.0%) | 2 (4.0%) | 8 (16.0%) | |

Comparison between the groups: Chi square test, taking p-value≤0.05 as significant.

**Table-3 Comparison of Breast Cancer Specific Survival (BCSS) Rates between the Groups Stratified for Various Sub Groups**

| Study Variables | Yes/No | Group A n=66 | Group B n=66 | p-value |
|---|---|---|---|---|
| **Age** | 30-45 years | 22 (100.0%) | 15 (78.9%) | 0.038 |
| | 46-60 years | 26 (92.9%) | 27 (87.1%) | 0.678 |
| **Pre-chemotherapy staging** | Stage-II | 29 (93.5%) | 27 (79.4%) | 0.153 |
| | Stage III | 19 (100.0%) | 15 (93.8%) | 0.457 |
| **Tumor Size** | 1-6 cm | 24 (92.1%) | 22 (81.5%) | 0.420 |
| | 7-12 cm | 24 (100.0%) | 20 (87.0%) | 0.109 |

Comparison between the groups: Chi square test/Fisher's Exact test, taking p-value≤0.05 as significant.

## Discussion

The treatment of breast cancer following neoadjuvant chemotherapy presents a critical decision between breast-conserving surgery and mastectomy.[15] Historically, mastectomy was the preferred approach due to concerns about local recurrence.[16] However, recent advancements have favored breast-conserving surgery, which aims to preserve breast tissue while achieving comparable oncological outcomes.[17,18] Despite these advances, local studies are lacking, creating a gap in region-specific data.[11-14] To address this, our study was designed to compare the efficacy of breast-conserving surgery versus mastectomy in terms of breast cancer-specific survival and other outcomes, providing essential insights and data for informed treatment decisions in our local context.

Mean age of the patients in this study was 43.13±7.80 years. Previously similar mean age in such patients was reported by Man et al. (2017)[11] in Hungy, Sisi et al. (2019)[13] in Egypt and Agarwal et al. (2023)[14] in India as 47 (range 25-68) years, 47.78±6.85 years and 49.2± 9 (IQR 43,56) years.

Regarding pre-chemotherapy staging, 65% of the participants were classified as Stage II. In Group A, 62% were at Stage II, while 68% of Group B were at Stage II. Man et al. (2017)[11] also had similar finding where the study cohort had 75% patients from stage II and 25.0% from group II. Likewise, Sisi et al. (2019)[13] reported it 78.0% vs. 22.0% for stage II and stage III, respectively.

In this study, tumor size had a mean of 5.90 ± 2.98 cm across the entire study sample. In Group A, the mean tumor size was 6.06 ± 2.85 cm, while Group B had a mean tumor size of 5.74 ± 3.12 cm. Man et al. (2017)[11] reported mean tumor size in the study as 4.0 (0.5-12)cm where 87.5% patients had tumor size <5 cm.

Out of the 100 participants, 90 (90.0%) had a positive BCSS, with 48 (96.0%) in Group A and 42 (84.0%) in Group B. This difference was statistically significant with a p-value of 0.046, indicating a higher BCSS rate in Group A compared to Group B. Our findings are inline with results of Song et al. (2023)[10] where BCSS rate was 98.9% vs. 90.4%; p-value=0.0005 between group A and B, respectively. Man et al. (2017),[11] however reported no significant difference between the groups with regard to disease free rate of survival by Akbar et al. (2020).[12] Agarwal et al. (2023)[14] reported disease free survival rate between group A and B as 71.0% vs. 58.3%; p-value<0.05. However, while stratifying BCSS between the groups on the basis of various sub groups, though group A maintained its supremacy, but due to quite higher survival rates in both the groups , statistical significance could not be achieved owing to small sample difference for stratification.

## Conclusion

In conclusion, the study reveals that breast-conserving surgery (Group A) leads to better breast cancer-specific survival (BCSS) rates compared to mastectomy (Group B). Patients in Group A had a higher BCSS rate, suggesting that breast-conserving surgery may offer superior survival outcomes after neoadjuvant chemotherapy. Although subgroup analyses did not yield significant results due to the small sample sizes, the overall findings support the effectiveness of breast-conserving surgery in enhancing survival rates. These results emphasize the potential benefits of opting for breast-conserving approaches in improving patient outcomes.

## Limitations & Recommendations

The study's strengths include its focus on comparing breast-conserving surgery and mastectomy post-neoadjuvant chemotherapy, offering valuable insights into regional outcomes. Additionally, it contributes essential data to an area with limited local research. However, limitations include the retrospective design and reliance on existing records, which may affect data accuracy. Subgroup analyses were constrained by small sample sizes, potentially impacting the generalizability and statistical significance of some findings.

**Conflict of Interest:** None
**Source of Funding:** None

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