OPTIMIZATION OF BREAST CANCER MANAGEMENT ACCORDING TO THE AGE IN FEMALE PATIENTS

Original Research

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Conflict of Interest: None   Grant Support & Financial Support: None

ABSTRACT

Background: Age at diagnosis plays a crucial role in determining the clinical presentation, treatment decisions, and outcomes in breast cancer. Both younger and older women exhibit unique clinicopathological characteristics that influence therapeutic approaches. However, data on age-specific management trends in the local population remain limited, particularly in the context of modern treatment modalities.

Objective: To determine the type of breast cancer management among female patients according to age group and to assess the association between age and treatment modality.

Methods: A descriptive study was conducted in the Department of Surgery, Khyber Teaching Hospital, Peshawar, over six months following ethical approval. A total of 147 female patients aged 20–80 years, newly diagnosed with breast cancer, were enrolled using non-probability consecutive sampling. Patients were categorized as young (≤40 years) or elderly (>40 years). Data on demographics, disease characteristics, and initial treatment modalities were collected using a structured proforma and analyzed using IBM SPSS version 25. Chi-square and Fisher's exact tests were applied, with $p \leq 0.05$ considered statistically significant.

Results: The mean age of patients was 47.2 ± 12.8 years, and the mean BMI was 27.4 ± 4.1 kg/m². Surgical therapy was the most common initial management (59.9%), followed by neoadjuvant chemotherapy (23.8%) and endocrine therapy (16.3%). Elderly patients were more likely to receive surgical and endocrine therapies, whereas younger patients more frequently received chemotherapy. Surgical management predominated in Stage I and II disease, while chemotherapy was more common in advanced stages and receptor-negative cases.

Conclusion: Age significantly influenced treatment selection, with elderly patients more likely to receive endocrine therapy and younger women undergoing multimodal treatments. Findings underscore the need for individualized, evidence-based management tailored to age, tumor biology, and disease stage.

Keywords: Age Factors, Breast Neoplasms, Chemotherapy, Endocrine Therapy, Neoadjuvant Therapy, Prognosis, Surgical Procedures, Treatment Outcome.

Age-Related Patterns in Breast Cancer Management

BACKGROUND

Age at diagnosis impacts treatment outcomes and management choices in breast cancer

OBJECTIVE

To determine the type of breast cancer management according to age grc_

147 Female Patients

Mean age: 47.2 years

Young (≤40 yea s): 40.1%

Elderly (>40 years): 59.9%

Stage II or III disease: 67,4 %

TREATMENT MODALITY

Surgical (MRM/BSC)

| 36% | 64% |

Neoadjuvant Chemotherapy

| 51% | 49% |

Endocrine Therapy

| 38% | 62% |

CONCLUSION

Elderly patients were more likely to receive endocrine therapy, whereas younger women more often received multimodal treatments

INTRODUCTION

Breast cancer remains one of the most prevalent malignancies affecting women worldwide, and age at diagnosis continues to be recognized as an important prognostic factor influencing both disease characteristics and outcomes (1). While increasing age has long been identified as a significant risk factor for the development of breast cancer, recent research has also suggested that the patient's age at the time of diagnosis may independently impact survival. Older women diagnosed with breast cancer often present with distinct clinical and pathological features, receive less aggressive treatment—often due to comorbidities or perceived frailty—and tend to have poorer outcomes compared to their younger counterparts (2,3). Conversely, several studies have demonstrated that younger women with breast cancer exhibit unique tumor biology, including higher-grade, hormone receptor–negative, and HER2-positive subtypes, which contribute to their unfavorable prognosis despite receiving intensive treatment (4). Although many studies have reported that both younger and older age groups at diagnosis are associated with inferior survival, the findings remain inconsistent across the literature. Some investigations have failed to identify a significant association between age and prognosis, leading to ongoing uncertainty about the precise influence of age on breast cancer outcomes (5). More recent evidence suggests that young women often experience worse outcomes regardless of the stage at presentation, with some attributing this disparity to biologically aggressive tumor characteristics and adverse biomarker profiles (6,7). However, other studies indicate that poorer outcomes in younger patients may be more pronounced in early-stage or node-negative disease, suggesting complex age-related interactions that warrant further exploration (8).

Importantly, much of the previously published data have focused on patients diagnosed before 2008, an era preceding the widespread adoption of anti-HER2 therapies and genomic profiling for treatment decision-making. Contemporary studies are therefore essential to re-evaluate the relationship between age and management patterns within the context of modern breast cancer care, which includes targeted and personalized therapeutic approaches (9,10). For example, a study reported that 57.7% of women with breast cancer underwent surgical management as their initial treatment, compared to 42.3% who received chemotherapy, highlighting the variation in treatment decisions based on clinical and demographic factors (7). Despite global research efforts, there remains a scarcity of data describing how treatment modalities for breast cancer vary according to age within local populations. Understanding these patterns is crucial, as it enables clinicians to offer age-appropriate counselling, optimize individualized care plans, and make informed therapeutic recommendations that align with both patient characteristics and disease biology. Therefore, this study is designed to determine the types of breast cancer management adopted among female patients according to age group, and to assess the association between age and type of management. The findings aim to contribute valuable insights into treatment decision-making and support improved patient counselling and care outcomes.

METHODS

This descriptive study was conducted in the Department of Surgery, Khyber Teaching Hospital, Peshawar, over a duration of six months following approval of the research synopsis by the Institutional Review Board (IRB) of the hospital. The study aimed to evaluate the type of breast cancer management adopted among female patients according to age group and to assess the association between age and treatment modality. The sample size was calculated using the World Health Organization (WHO) sample size estimation formula, assuming an anticipated proportion of surgical treatment in female patients with breast cancer of 28.9% (7), a margin of error of 8%, and a confidence level of 95%. The calculated sample size was 147. A non-probability consecutive sampling technique was employed to recruit participants meeting the eligibility criteria. Female patients aged between 20 and 80 years, diagnosed with breast cancer according to the operational definition, were included in the study. Patients with a prior history of breast cancer treatment, those who were severely cardiopulmonary compromised, hypersensitive to anti-cancer drugs, or suffering from concurrent illnesses that could alter the treatment plan were excluded. Additionally, patients presenting with metastatic disease were not considered for inclusion. After obtaining ethical clearance, eligible participants were enrolled from the indoor department of surgery. Informed written consent was obtained from all participants after a detailed explanation of the study objectives, procedures, potential benefits, and risks. Confidentiality of participant information was ensured throughout the study. Baseline demographic data, including age, body mass index (BMI), residence (rural or urban), profession, educational level, and socioeconomic status, were collected using a structured proforma designed specifically for the study. Detailed medical history was recorded, including comorbidities such as diabetes, hypertension, and prior surgical history, as well as family history of breast cancer. The age of each participant was confirmed using the date of birth as mentioned on the National Identity Card. Age at the time of presentation was used to classify patients into two groups: young (≤40 years) and elderly (>40 years), as per operational definitions.

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Each case was reviewed in a multidisciplinary clinicopathological conference (CPC), comprising a breast surgeon, oncologist, endocrinologist, and psychiatrist, to ensure optimal treatment planning. Disease staging was determined according to clinical and pathological findings. The initial treatment modality was recorded as surgical therapy, chemotherapy, or endocrine therapy, based on the operational definitions provided. Surgical therapy referred to removal of tumor tissue, chemotherapy involved administration of cytotoxic drugs such as paclitaxel or gemcitabine, and endocrine therapy included anti-estrogenic agents such as tamoxifen or aromatase inhibitors like letrozole. All data were collected by the principal investigator using the predesigned proforma. Data analysis was performed using IBM SPSS Statistics version 25. Quantitative variables such as age and BMI were expressed as mean ± standard deviation (SD) or median (interquartile range) after checking data normality using the Shapiro–Wilk test. Qualitative variables including age group, residence, education, socioeconomic status, disease stage, and treatment modality were presented as frequencies and percentages. The association between treatment modality and age group was assessed using the Chi-square test or Fisher's exact test where applicable. A p-value ≤ 0.05 was considered statistically significant. To address potential confounding, effect modifiers such as BMI, residence, affected side, and disease stage were controlled through stratification, followed by post-stratification Chi-square or Fisher's exact test at the 5% significance level. All ethical principles of biomedical research were strictly followed. Participants were informed of their right to withdraw from the study at any stage without affecting their treatment. Data confidentiality was maintained, and no financial or personal conflict of interest was declared by the investigator.

RESULTS

A total of 147 female patients diagnosed with breast cancer were included in this study. The mean age of participants was 47.2 ± 12.8 years, and the mean BMI was 27.4 ± 4.1 kg/m². Out of the total, 40.1% of patients were classified as young (≤40 years) and 59.9% as elderly (>40 years). Most participants belonged to the middle socioeconomic class (49.0%), followed by the lower (32.7%) and upper (18.3%) classes. The majority of patients were unemployed (58.5%) and resided in urban areas (53.7%). Regarding education, 42.9% had higher education, 34.7% had middle-level education, and 22.4% had only primary education. The right breast was affected in 54.4% of patients, while the left was involved in 45.6%. With respect to disease stage, 18.4% were diagnosed at Stage I, 36.1% at Stage II, 31.3% at Stage III, and 14.3% at Stage IV. Receptor status analysis showed that 62.6% were receptor-positive while 37.4% were receptor-negative (Table 1). Among all treatment modalities, surgical management (modified radical mastectomy or breast-conserving surgery) was the most frequent, performed in 59.9% of patients (n=88). Neoadjuvant chemotherapy was administered in 23.8% (n=35), and endocrine therapy was used in 16.3% (n=24). When stratified by age, 36.4% (n=32) of surgical patients were young, and 63.6% (n=56) were elderly. Neoadjuvant chemotherapy was almost equally distributed between young (n=18; 51.4%) and elderly (n=17; 48.6%) patients. Endocrine therapy was more common among elderly women (n=15; 62.5%) (Table 2). When analyzed according to disease stage, surgical management predominated in Stage II (33 cases, 37.5%) and Stage III (26 cases, 29.5%). Neoadjuvant chemotherapy was more frequently administered at advanced stages, with 15 patients (42.8%) receiving it at Stage III and 7 (20%) at Stage IV. Endocrine therapy usage increased with disease advancement, accounting for 8 cases (33.3%) in Stage III and 7 (29.2%) in Stage IV (Table 3). Considering receptor status, surgical treatment was common among receptor-positive patients (n=54; 61.4%) compared to receptor-negative patients (n=34; 38.6%). Neoadjuvant chemotherapy showed a higher proportion in receptor-negative cases (n=19; 54.3%), whereas endocrine therapy was predominantly administered in receptor-positive patients (n=20; 83.3%) (Table 4). The bar chart (Figure 1) illustrates the distribution of treatment modalities by age group, highlighting that surgical management remained the primary treatment choice across both groups, though elderly patients had a higher frequency. The pie chart (Figure 2) depicts the overall distribution of treatment modalities, showing that nearly three-fifths of patients underwent surgical intervention, while chemotherapy and endocrine therapy formed the remaining treatment proportions.

Table 1: Demographic Characteristics of Study Participants (n = 147)

Variable	Value
Mean Age (years) ± SD	47.2 ± 12.8
Mean BMI (kg/m²) ± SD	27.4 ± 4.1
Occupation Status	
Lower (%)	32.7
Middle (%)	49.0
Upper (%)	18.3
Employed (%)	41.5
Unemployed (%)	58.5
Residence	
Rural (%)	46.3
Urban (%)	53.7
Education	
Primary (%)	22.4
Middle (%)	34.7
Higher (%)	42.9
Affected Breast	
Right (%)	54.4
Left (%)	45.6
Disease Stage	
Stage I (%)	18.4
Stage II (%)	36.1
Stage III (%)	31.3
Stage IV (%)	14.3
Receptor Status	
Positive (%)	62.6
Negative (%)	37.4
Age Group	
Young (≤40 years) (%)	40.1
Elderly (>40 years) (%)	59.9

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Table 2: Distribution of Treatment Modalities by Age Group

Treatment Modality	Young (≤40 years) n (%)	Elderly (>40 years) n (%)	Total (n = 147)
Surgical (MRM/BSC)	32 (36.4)	56 (63.6)	88
Neoadjuvant Chemotherapy	18 (51.4)	17 (48.6)	35
Endocrine Therapy	9 (37.5)	15 (62.5)	24

Table 3: Treatment Modalities According to Disease Stage

Disease Stage	Surgical (MRM/BSC) n (%)	Neoadjuvant Chemotherapy n (%)	Endocrine Therapy n (%)
Stage I	20 (22.7)	3 (8.6)	4 (16.7)
Stage II	33 (37.5)	10 (28.6)	5 (20.8)
Stage III	26 (29.5)	15 (42.8)	8 (33.3)
Stage IV	9 (10.3)	7 (20.0)	7 (29.2)

Table 4: Treatment Modalities According to Receptor Status

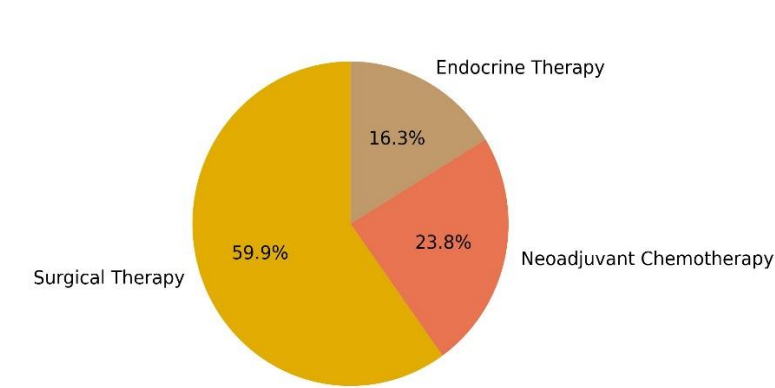| Receptor Status	Surgical (MRM/BSC) n (%)	Neoadjuvant Chemotherapy n (%)	Endocrine Therapy n (%)
Receptor Positive	54 (61.4)	16 (45.7)	20 (83.3)
Receptor Negative	34 (38.6)	19 (54.3)	4 (16.7)

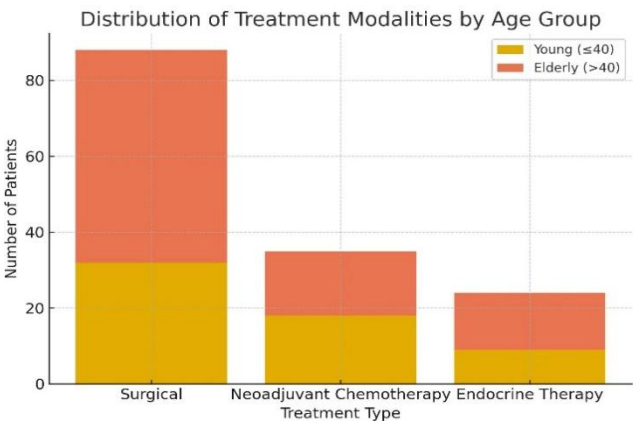*Figure 2 Overall Distribution of Breast Cancer Treatment Modalities*

Figure 2 Distribution of Treatment Modalities by Age Group

DISCUSSION

The results of this descriptive study provided a clear picture of the pattern of breast cancer management in the cohort of 147 female patients, stratified by age, disease stage and receptor status. The demographic profile and treatment choices illustrate distinct trends that warrant attention, and when considered in the light of recent literature, raise important implications for clinical practice as well as future research. The study population had a mean age of 47.2 years, with 40.1% of patients categorized as young (≤ 40 years) and 59.9% as elderly (> 40 years). The mean BMI was 27.4 kg/m². The majority belonged to middle socioeconomic status (49.0%), were unemployed

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(58.5%), and lived in urban areas (53.7%). Most had higher education (42.9%), and the right breast was slightly more often involved than the left (54.4% vs. 45.6%). On staging, 18.4% had Stage I, 36.1% Stage II, 31.3% Stage III, and 14.3% Stage IV disease. Receptor-positive disease accounted for 62.6% of the cohort, while 37.4% were receptor-negative. Surgical therapy (modified radical mastectomy or breast-conserving surgery) was the predominant initial management, used in 59.9% of patients; neoadjuvant chemotherapy and endocrine therapy were used in 23.8% and 16.3%, respectively. When stratified by age, elderly patients more frequently underwent surgical treatment (63.6% vs. 36.4% in young), whereas the proportions receiving neoadjuvant chemotherapy were similar between the two groups, and endocrine therapy was more common among elderly women (62.5% of endocrine-treated). Treatment allocation also varied by disease stage and receptor status: surgical treatment was predominant in Stage II and III, neoadjuvant chemotherapy increased with advanced stage (especially Stage III and IV), and endocrine therapy was largely used in receptor-positive patients, while receptor-negative patients more often received chemotherapy.

These findings align with broader observations in recent literature. For example, a large recent study reported that younger women tend to present with more aggressive tumor biology and receive heterogeneous treatment modalities, while older adults often show variable treatment patterns due to comorbidity and physiologic age considerations (11). In particular, the tendency for young women to have receptor-negative or more aggressive subtypes has been consistently documented, which may influence the choice of systemic therapy over surgery or endocrine therapy (12,13). Moreover, disparities in treatment allocation, especially under-treatment or tailored therapy in older patients, have been described in older adult cohorts (14). The predominance of surgical management in this cohort reflects both the stage distribution (most patients in Stage II/III) and institutional treatment protocols favoring surgery as first-line therapy when feasible. The similar rates of neoadjuvant chemotherapy in young and elderly groups may suggest that clinical decision-making prioritized disease stage and receptor status over age alone — a favorable alignment with individualized medical care. The higher use of endocrine therapy in elderly, receptor-positive patients is consistent with the principle of tailoring systemic therapy based on receptor expression and expected tolerability. These results carry important implications (15-17). First, they demonstrate that in a real-world setting, age influences treatment patterns but does not rigidly dictate them — factors such as stage and receptor status remain central. This supports a patient-centered approach rather than age-based assumptions. Secondly, the high proportion of surgical therapy suggests that early detection and operability remain achievable for many patients in this context, which could be further improved by public health efforts. Thirdly, the data reveal potential treatment gaps: for example, receptor-negative patients may rely heavily on chemotherapy, and younger patients with aggressive biology may require closer follow-up and perhaps more aggressive multimodal therapy (18,19).

The study had several strengths. It prospectively collected detailed demographic, clinical, pathological, and treatment data in a standardized proforma, reviewed by a multidisciplinary team. The use of categorical stratification and statistical testing (chi-square/Fisher exact) permits assessment of association between age and management patterns, controlling for potential confounders such as BMI, residence, disease stage, and tumor laterality. However, several limitations must be acknowledged. The study defined treatment modality only as the initial therapy (surgery, neoadjuvant chemotherapy, or endocrine therapy), and did not account for sequential multimodal treatments (adjuvant chemotherapy, radiotherapy, hormone therapy after surgery), which are common in breast cancer care. This may underestimate the complexity and fullness of cancer management. The age cutoff of 40 years to dichotomize 'young' versus 'elderly' is somewhat arbitrary and may obscure distinctions within each group, such as pre-menopausal versus older pre-menopausal women, or early elderly versus very old. The sample size, though calculated appropriately, remains modest and limits generalizability. Additionally, missing data on receptor subtype details (e.g., HER2 status, triple-negative vs. luminal), grade, lymph node involvement, and molecular profiling limits deeper comparison with international cohorts and survival outcome analysis. Finally, follow-up data for survival, recurrence, and long-term outcomes were not included; thus, conclusions about prognosis based on age or treatment modality cannot be drawn.

Future research should incorporate a larger sample size across multiple centers to increase representativeness. Studies should record complete treatment sequences (neoadjuvant, adjuvant, radiotherapy, endocrine maintenance) and include follow-up for recurrence and survival, ideally over 5–10 years (20,21). Stratification using more clinically meaningful age bands (e.g., ≤ 35, 36–50, 51–65, > 65) might better reflect biologic differences. Inclusion of tumor grade, lymph node status, molecular subtype (ER/PR/HER2/TNBC), genomic risk scores, and comorbidities would enable more nuanced analysis of how age influences treatment decisions and outcomes. Moreover, qualitative studies exploring patient preferences, physician decision-making, and resource limitations in local settings could provide insight into why certain treatment patterns emerge. In conclusion, the study revealed that surgical therapy remained the cornerstone of initial breast cancer management in this cohort, with treatment patterns varying by age, disease stage, and receptor status

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rather than by age alone. While age appeared to influence the distribution of endocrine therapy and overall modality choice, the data suggest that clinical and pathological factors predominated in guiding management. Further comprehensive studies including full treatment courses and long-term follow-up are warranted to elucidate how age at diagnosis truly affects breast cancer outcomes in this population.

CONCLUSION

The study concluded that surgical management remains the predominant initial treatment for breast cancer, while chemotherapy and endocrine therapy are selectively used based on disease stage, receptor status, and age. Elderly patients were more likely to receive endocrine therapy, whereas younger women often required multimodal approaches. These findings highlight the importance of individualized, biology-driven treatment planning rather than age-based decisions, emphasizing the need for comprehensive, multidisciplinary strategies to optimize outcomes in breast cancer management.

AUTHOR CONTRIBUTION

Author	Contribution
Reema Jehan	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Spogmay Humayun*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Mah Muneer Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Jafar Hussain	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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