JALALABAD MEDICAL JOURNAL

Original Article

Pattern of Hormone Receptors (Estrogen and Progesterone) and Human Epidermal Growth Factor 2 Status in Breast Cancer Patients in a Tertiary Care Centre

Suchanda Ray[1], Shajia Chowdhury[2], Md Abed Hossain[3], Md Ishtiaque Alam[4]

[1,2]Associate Professor, Department of Pathology, Jalalabad Ragib-Rabeya Medical College, Sylhet.

[3]Professor, Department of Pathology, Jalalabad Ragib-Rabeya Medical College, Sylhet.

[4]Associate Professor, Department of Oncology, Jalalabad Ragib-Rabeya Medical College, Sylhet.

ABSTRACT

Breast cancer remains one of the most prevalent malignancies affecting women globally, with significant morbidity and mortality rates. Hormone receptor status, particularly estrogen receptor (ER) and progesterone receptor (PR), along with human epidermal growth factor receptor 2 (HER2) statuses, are pivotal factors influencing breast cancer progression and therapeutic responses. This study aims to analyse the estrogen and progesterone receptor and HER2 status in breast cancer patients treated at a tertiary care centre. This cross-sectional study was conducted from June 1, 2023, to November 30, 2023, at Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet. Data were collected from medical records, pathology reports, and treatment records of 81 female breast cancer patients. ER positive status was found in 60.5% of patients, and PR positive status in 49.4%. HER2 positivity was present in 19.8% of patients. Invasive ductal carcinoma was the most common histopathological subtype (86.4%), with grade II tumours being the most prevalent (81.5%). ER and PR positivity was found in 62.8% and 51.4% of cases of invasive ductal cell carcinoma, while HER2 was found in 22.8% of cases. This study highlights the demographic and molecular characteristics of breast cancer patients in a tertiary care centre, emphasising age-related variations in hormone receptor and HER2 status. The findings underscore the importance of comprehensive profiling in optimising breast cancer management and support the need for further research to enhance treatment strategies and improve patient outcomes.

Keywords: *Breast cancer, Estrogen receptor, Progesterone receptor, Human epidermal growth gactor 2.*

[Jalalabad Med J 2025; 22 (1): 28-32]; DOI: https://doi.org/10.3329/jmj.v22i1.86502

INTRODUCTION

Breast cancer remains one of the most prevalent malignancies affecting women globally, with significant morbidity and mortality rates. Among the pivotal factors influencing breast cancer progression and therapeutic responses are the hormone receptor status, particularly estrogen receptor (ER) and progesterone receptor (PR), along with the human epidermal growth factor-2 (HER2) status. Estrogen receptor (ER) and progesterone receptor (PR) are crucial biomarkers in breast cancer, dictating tumour behaviour and therapeutic strategies. ER-positive tumours, accounting for approximately 70% of breast cancers, are characterised by the presence of estrogen receptors on cancer cells, rendering them responsive to hormonal therapies such as tamoxifen and aromatase inhibitors[1]. The progesterone receptor (PR), often co-expressed with the ER, further delineates the hormonal milieu of breast tumours. PR positivity signifies intact hormonal signalling pathways and correlates with better prognosis and responsiveness to endocrine therapies[2]. On

Address of correspondence:
Dr Suchanda Ray, Associate professor, Department of Pathology, Jalalabad Ragib-Rabeya Medical College, Sylhet. Email: saummadiproy@gmail.com.

the other hand, hormone receptor-negative breast cancers don't express ER or PR. They are a more aggressive subtype that has worse outcomes and fewer treatment options. In the absence of hormonal targets, chemotherapy remains the cornerstone of management for these tumours, highlighting the critical role of hormone receptor status in therapeutic decision-making[3]. In addition to the status of hormone receptors, another important molecular change in the development of breast cancer is the overexpression of human epidermal growth factor-2 (HER2). HER2, a transmembrane receptor tyrosine kinase, plays a crucial role in cell proliferation, survival, and differentiation[4]. Amplification or overexpression of HER2 occurs in approximately 15-20% of breast cancers, leading to dysregulated signalling cascades and aggressive tumour behaviour[5]. HER2-positive breast cancers exhibit distinct clinical features, including higher histological grade, increased risk of recurrence, and decreased overall survival rates[6]. However, the advent of targeted therapies, such as trastuzumab, pertuzumab, and ado-trastuzumabemtansine (T-DM1), has revolutionised the management of HER2-positive breast cancer, substantially improving patient outcomes and prognosis[7]. Furthermore, the interaction between hormone receptor status and HER2 amplification delineates distinct molecular subtypes of breast cancer with varying clinical behaviours and therapeutic responses. Triple-negative breast cancer (TNBC), characterised by the absence of ER, PR, and HER2 expression, represents a challenging subtype associated with an aggressive disease course and limited treatment options[8]. Conversely, hormone receptor-positive and HER2-negative tumours constitute the largest subgroup, benefiting from endocrine therapies targeting ER and PR signalling pathways[9]. Understanding the intricate crosstalk between hormone receptors and HER2 signalling pathways is paramount for personalised breast cancer management. Biomarker assessment, including ER, PR, and HER2 status, guides treatment selection, optimising therapeutic efficacy and minimising unnecessary toxicity[10]. Moreover, ongoing research efforts continue to unravel the complex molecular landscape of breast cancer, paving the way for novel targeted therapies and precision medicine approaches. In this study, we observed the distribution of estrogen and progesterone receptor and the human epidermal growth factor-2 (HER2) status in breast cancer patients that may provide insights into the evolving landscape of breast cancer management and future directions in precision oncology.

MATERIALS AND METHODS

The cross-sectional study was conducted from 1st June, 2023, to 30th November, 2023. Data was collected from the medical records of breast cancer patients treated at the Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet, over six months. Only adult female patients diagnosed with breast cancer who had received treatment were recruited in the study. Patients over the age of 60 and under the age of 18 were excluded from the study. A total of 81 patients were included in the study by convenient sampling method. Relevant data like patients' demographics, hormone receptor status, HER2 status, histopathological findings, and baseline characteristics were extracted from medical records, pathology reports, and treatment records. The procedure of data collection was based on patients' profiles (age and frequency) on admission in the surgery department of JRRMC, as well as the histopathological records of these cases, after operative treatment was collected from the department of pathology in the study place. Distribution of hormone reception and HER2 receptor was carried out in the oncology department. Ethical issues were maintained properly. Data were analysed manually. Descriptive statistics was used to summarise patient characteristics and tumour features.

RESULTS

Among 81 patients, 60.5% (n=49) of the patients were estrogen receptor (ER) positive, while 49.4% (n=40) were progesterone receptor (PR) positive. 46.9% of the participants were both ER and PR positive, and 37% were both ER and PR negative (table-I).

Table-I: *Distribution of the study population based on hormone receptors, n=81.*

Hormone receptors	Frequency	Percentage
ER positive	49	60.5
PR positive	40	49.4
Both ER and PR positive	38	46.9
Both ER and PR negative	30	37

*ER= Estrogen receptor, PR= Progesterone receptor
*Some patients had more than one hormone receptor positivity.

Among the 49 ER positive patients, the majority (30.6%) were between the age group of 50-59 years, while in the PR receptor positive group, the majority (37.5%) were between the age group of 40-49 years (table-II). Human epidermal growth factor-2 (HER2) was positive in 19.8% of breast cancer patients, while most of the patients (76.5%) were HER2 negative (table-III). Among the participants, 5 (6.1%) patients were triple-positive (ER, PR and HER2 positive). Among HER2 receptor positive cases, the majority (37.5%) were between the age group 20-29 years (table-IV).

The histopathological analysis of the 81 breast cancer

patients revealed that the most common type was invasive ductal cell carcinoma, accounting for 85.2% of the cases. Other histopathological findings included ductal carcinoma in situ (3.7%), medullary carcinoma (2.5%), invasive papillary carcinoma (6.2%), and mucinous carcinoma (1.2%) (table-V).

The distribution of the study population based on cancer grading showed that the majority (81.5%) of the breast cancer patients were diagnosed with Grade II tumours. Grade III tumours were observed in 9.9% of the patients, while Grade I tumours were the least common, comprising 8.6% of the cases (table-VI).

Among the 70 cases of invasive ductal cell carcinoma, 44 (62.8%) were ER positive and 36 (51.4%) were PR positive and 33 (47.1%) of the invasive ductal cell carcinoma cases were both ER and PR positive. HER2 positive was found in 22.8% of cases (table-VII).

Among the 5 cases of invasive papillary carcinoma, 60% were both ER and PR positive. Among the 3 cases of ductal carcinoma in situ, 1 (33.3%) was ER positive and 2 (66.6%) were PR positive and 1 (33.3%) case was both ER and PR positive. Among one case of mucinous carcinoma, both ER and PR positivity was found. All of the cases of invasive papillary carcinoma, ductal carcinoma in situ, and mucinous carcinoma were HER2 negative. Whereas, all of the cases of medullary carcinoma were ER, PR and HER2 negative (table-VII).

Table-VIII presents the distribution of the study population based on hormone receptor status (ER and PR) and cancer grade. In both ER and PR positive groups, most of the patients were presented as grade II cancer (87.7% and 7.5%, respectively).

Table-II: *Distribution of the study population based on age and hormone receptor status.*

Age group (years)	Hormone receptors			
	ER+ve n=49	Percentage	PR+ve n=40	Percentage
20-29	4	8.2	2	5
30-39	5	10.2	2	5
40-49	14	28.6	15	37.5
50-59	15	30.6	14	35
>60	11	22.4	7	17.5

*Patients had more than one hormone receptor positivity.

Table-III: *Distribution of the study population based on HER 2 receptor status, n=81.*

HER2 receptor	Frequency	Percentage
Positive	16	19.8
Negative	62	76.5
Equivocal	1	1.2
Not done	2	2.5

Table-IV: *Distribution of the study population based on age and HER 2 receptor, n=16.*

Age	HER2 receptors n=16	Percentage
20-29	6	37.5
30-39	2	12.5
40-49	3	18.8
50-59	3	18.8
>60	2	12.5

Table-V: *Distribution of the study population based on histopathology findings, n=81.*

Histopathology findings	Frequency	Percentage
Ductal carcinoma in situ	3	3.7
Medullary carcinoma	2	2.5
Invasive ductal cell carcinoma	70	86.4
Invasive papillary carcinoma	5	6.2
Mucinous carcinoma	1	1.2

Table-VI: *Distribution of the study population based on cancer grading, n=81.*

Grade	Frequency	Percentage
Grade I	7	8.6
Grade II	66	81.5
Grade III	8	9.9

DISCUSSION

The findings from our study provide valuable insights into the demographic and molecular characteristics of breast cancer patients treated at a tertiary care centre.

The study revealed that 60.5% of the patients were ER positive, and 49.4% were PR positive. Our study also highlighted that the highest prevalence of ER and PR positive cases was observed in the 40-49 years and 50-59 years age groups. These findings align with those reported by AlZaman et al., who also observed higher hormone receptor positivity in older age groups[11]. Similarly, Pourzand et al. noted that younger women were less likely to be hormone receptor-positive, which correlates with our finding of lower percentages of ER and PR positive in younger age groups[12].The prevalence of HER2 positivity in our study was 19.8%, which is within the range reported in various studies, including the population-based study by

Table-VII: *Distribution of patients based on hormone receptors positivity and HER2 in different types of breast carcinoma, n=81.*

Variables	Invasive ductal cell carcinoma (n=70)	Invasive papillary carcinoma (n=5)	Ductal carcinoma insitu (n=3)	Medullary carcinoma (n=2)	Mucinous carcinoma (n=1)
ER (%)	44 (62.8)	3 (60)	1 (33.3)	0 (0)	1 (100)
PR (%)	36 (51.4)	3 (60)	2 (66.6)	0 (0)	1 (100)
Both ER and PR (%)	33 (47.1)	3 (60)	1 (33.3)	0 (0)	1 (100)
HER2 (%)	16 (22.8)	0 (0)	0 (0)	0 (0)	0 (0)

Table-VIII: *Distribution of study population based on hormone receptor positive and cancer grading, n=81.*

Grade	Hormone receptors			
	ER+ve n=49	Percentage	PR+ve n=40	Percentage
I	4	8.2	3	7.5
II	43	87.7	31	77.5
III	2	4.1	6	15

Beltjens et al., which reported a HER2 positivity rate of 12.8% over a ten-year period[13]. Histopathologically, invasive ductal carcinoma was the most common type, accounting for 86.4% of cases, which is consistent with the findings of many studies, including the study by Aman et al., who reported invasive ductal carcinoma as the predominant histologic type in Ivorian breast cancer patients[14]. Other types, such as ductal carcinoma in situ and medullary carcinoma, were less common in our study. The high prevalence of invasive ductal carcinoma underscores the importance of this subtype in breast cancer epidemiology and management. Our study also found that Grade II tumours were the most common (81.5%), followed by Grade III (9.9%) and Grade I tumours (8.6%). This distribution of tumour grades is similar to the findings of Pourzand et al., who observed a significant correlation between higher tumour grades and HER2 positivity[12]. The stability of HER2 positivity rates and their association with higher tumour grades have been well-documented, as evidenced by studies such as those by Beltjens et al., which emphasise the importance of HER2 testing for accurate prognostication and treatment planning[15]. Comparatively, studies by Meattini et al. highlight the prognostic implications of HER2 positivity and hormone receptor status, particularly in small, node-negative breast cancers, where HER2 positivity is associated with worse distant recurrence-free survival[16]. These insights are critical for tailoring treatment strategies, especially in young patients who may present with aggressive tumour characteristics. Among the patients in our study, a subset of 5 patients was found to be positive for all three hormone receptors- ER, PR, and HER2. This triple-positive breast cancer subtype is of particular interest due to its distinct biological characteristics and therapeutic implications. These patients often benefit from a combination of endocrine therapy and HER2-targeted therapies, which can significantly improve outcomes. The presence of triple-positive cases in our cohort highlights the importance of comprehensive receptor testing to guide personalised treatment strategies, as well as the need for ongoing research to optimise therapy combinations for this subgroup.

In addition to the triple-positive cases, we also analysed the distribution of hormone receptor positivity (ER and PR) across different cancer grades. Our findings revealed that the majority of ER and PR positivetumours were classified as Grade II, accounting for 87.7% and 77.5% of cases, respectively. In contrast, lower percentages were observed in Grade I and Grade III tumours. These results suggest that hormone receptor-positive breast cancers in our cohort are predominantly of intermediate grade, which may have implications for treatment planning and prognosis.

CONCLUSION

This study provides significant insights into the demographic and molecular characteristics of breast cancer patients treated at a tertiary care centre. The majority of patients were middle-aged, with a notable prevalence of hormone receptor-positive tumours, particularly in older age groups. Invasive ductal carcinoma was the predominant histopathological subtype, with grade II tumours being the most common. These findings align with existing literature and emphasise the importance of comprehensive demographic and molecular profiling in breast cancer management. Further research is warranted to explore the prognostic implications of these molecular

markers and refine treatment protocols, ultimately improving patient outcomes and advancing precision oncology in breast cancer care.

REFERENCES

1. Early Breast Cancer Trialists' Collaborative Group. Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. Lancet 2005; 365 (9472): 1687-717.
2. Yip CH, Rhodes A. Estrogen and progesterone receptors in breast cancer. Future Oncol 2014; 10 (14): 2293-301.
3. Liedtke C, Mazouni C, Hess KR, André F, Tordai A, Mejia JA, et al. Response to neoadjuvant therapy and long-term survival in patients with triple-negative breast cancer. J Clin Oncol 2008; 26 (8): 1275-81.
4. Iqbal N, Iqbal N. Human epidermal growth factor receptor 2 (HER2) in cancers: overexpression and therapeutic implications. MolBiolInt 2014; 2014: 852748. doi: 10.1155/2014/852748.
5. Krishnamurti U, Silverman JF. HER2 in breast cancer: a review and update. Adv Anat Pathol 2014; 21 (2): 100-7.
6. Fan Y, Wang Y, He L, Imani S, Wen Q. Clinical features of patients with HER2-positive breast cancer and development of a nomogram for predicting survival. ESMO Open 2021; 6 (4): 100232. doi: 10.1016/j.esmoop.2021.100232.
7. Verma S, Miles D, Gianni L, Krop IE, Welslau M, Baselga J, et al. Trastuzumabemtansine for HER2-positive advanced breast cancer. N Engl J Med 2012; 367 (19): 1783-91.
8. Carey LA, Perou CM, Livasy CA, Dressler LG, Cowan D, Conway K, et al. Race, breast cancer subtypes, and survival in the Carolina Breast Cancer Study. J Am Med Assoc 2006; 295 (21): 2492-502.
9. Schettini F, Giuliano M, Giudici F, Conte B, De Placido P, Venturini S, et al. Endocrine-based treatments in clinically-relevant subgroups of hormone receptor-positive/HER2-negative metastatic breast cancer: systematic review and meta-analysis. Cancers 2021; 13 (6): 1458.
10. Hammond ME, Hayes DF, Dowsett M, Allred DC, Hagerty KL, Badve S, et al. American Society of Clinical Oncology/College of American Pathologists guideline recommendations for immunohistochemical testing of estrogen and progesterone receptors in breast cancer (unabridged version). Archives of pathology & laboratory medicine 2010; 134 (7): e48-72.
11. AlZaman AS, Mughal SA, AlZaman YS, AlZaman ES. Correlation between hormone receptor status and age, and its prognostic implications in breast cancer patients in Bahrain. Saudi Med J 2016; 37 (1) :37-42.
12. Pourzand A, Fakhree MB, Hashemzadeh S, Halimi M, Daryani A. Hormone receptor status in breast cancer and its relation to age and other prognostic factors. Breast Cancer 2011; 5: 87-92.
13. Beltjens F, Bertaut A, Pigeonnat S, Pouget N, Guiu S, Poillot ML, et al. HER2 positive breast carcinomas: trend in evolution between 1998 and 2008 and relationship with clinico-pathological characteristics in a population based study. Cancer Research 2012; 72: 615.
14. Aman NA, Doukoure B, Koffi KD, Koui BS, Traore ZC, Kouyate M, et al. HER2 overexpression and correlation with other significant clinicopathologic parameters in Ivorian breast cancer women. BMC Clin Pathol 2019; 19: 1-6.
15. Beltjens F, Bertaut A, Pigeonnat S, Loustalot C, Desmoulins I, Charon-Barra C, et al. HER 2 positivity rates in breast cancer: no variation over time when clinicopathological features and testing are stable. Eur J Cancer Care (Engl) 2017; 26 (2). doi: 10.1111/ecc.12404.
16. Meattini I, Livi L, Saieva C, Agresti B, Scotti V, Nori J, et al. Prognostic value of HER2 positivity and negative hormonal status in patients with small tumor (<1cm) and node-negative breast cancer. Cancer Res 2011; 71 (24_Supplement): P2-12.