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Original Research Article

A Study of Hormonal Receptors in Patients of Carcinoma Breast and Its Prognostic Importance

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Abstract:

Background: A growing body of research highlights the significance of HER-2 expression, young age, ER, PR, and PR status in breast cancer patients.

Patients and methods: In this analytical cross-sectional analysis of 105 breast cancer patients who underwent surgery between October 2019 and September 2021. Age, size, hormone receptor status, HER-2 expression, and P53 expression were all examined as potential indicators of lymph node involvement.

Results: Positive progesterone receptor status and being under 40 years old are directly correlated (P <0.05). Additionally, young women's tumours were more likely to be large and in advanced stages than older women's tumours (P <0.05). Furthermore, HER-2 overexpression was more common in patients with negative progesterone receptor status (P<0.05). The likelihood of lymph node metastasis varied between hormone receptor statuses, although these changes were not statistically significant.

Conclusion: It is probable that higher stage and larger size breast cancer in younger women is connected to positive progesterone receptor status, despite the fact that tumours with negative progesterone receptor status were more likely to have HER-2 overexpression.

Keywords: Breast Cancer, Estrogen Receptor, Progesterone Receptor, Lymph Node Metastasis, Age.

Introduction

Breast cancer is the second most frequent cancer in the world and most common form of cancer in India. The second leading cause of cancer death among American women. [1] According to studies, younger women's breast cancer is distinct from older women's breast cancer and requires a different approach to therapy. [2–5]

The majority of breast cancer studies have concentrated on older women because the disease is more prevalent in these groups of women. [6] Numerous studies have shown that breast cancer tends to be more progressed and aggressive in younger age groups than it is in older age groups.2–5,7,8 Additionally, compared to breast tumours in older age groups, breast tumours in younger age groups were more likely to be higher grade, hormone receptor-negative, poorly differentiated, aneuploid, have a high S-phase fraction, abnormal P53 expression, a greater extent of lymphovascular invasion, and overexpress the human epidermal growth factor receptor 2 (HER-2). [2–5]

Women under the age of 45 were found to experience local recurrence four times more frequently than women over the age of 65. [9] In a different retrospective study, women under the age of 40 who underwent a primary breast-conserving operation followed by adjuvant radiation with or without chemotherapy experienced a local recurrence rate of 38% at 10 years, and the relative risk of locoregional recurrence increased by 7% for every decreasing year of age 10. Only young age was used in that study as a predictive factor for locoregional recurrence. It is still unclear and poorly understood why women under 40 experience lower local recurrence than women over 40. In terms of clinical characteristics, younger women with a palpable mass who are diagnosed with breast cancer have larger tumour sizes, more lymph node metastases, and more invasive malignancies than older women. [2,7,8]

An important prognostic indicator of advanced disease status and the likelihood that cancer cells have migrated to distant places is lymph node metastasis. 30% to 50% of all breast cancers at diagnosis had spread to the sentinel lymph node.

Material and Methods

The study population included 105 patients with unilateral breast cancer who underwent modified radical mastectomy with axillary dissection at Nalanda Medical College and Hospital, Patna and I.G.I.M.S, Patna Bihar, between October 2019 and September 2021. Included were all varieties of invasive cancer with histological confirmation.

Patient age, tumour size, stage, histologic type, oestrogen and progesterone receptor status, P53 expression, and HER-2 expression were all extracted retrospectively. The relationship between each of these variables and lymph node involvement, as measured by the number of nodes with metastases, was examined independently. The issue of variations between laboratories was resolved by doing all studies in a single facility using the same methodology. Patients were separated into two age groups: <40 years and ≥40 years.

Age, tumour stage (I, II, III, IV, and unstaged), oestrogen receptor (ER), progesterone receptor (PR) (positive and negative), P53 expression, HER-2 expression (positive and negative), and laterality were noted for both the patient and the tumour. Tumor size in cm (≤2 or T1, 2 to 5 or T2, ≥5 or T3, and T4), number of nodes involved (none or N0, one to three or N1, four to nine or N

The biggest diameter in the gross specimen was used to calculate the tumor's size. When the hormone receptor concentration fell below 10%, they were regarded as negative. When nuclear staining was present in more than 10% of tumour cells, P53 was deemed positive. When complete and vigorous membrane staining was found in more than 10% of tumoral cells, HER-2/neu over expression was deemed positive.

For statistical evaluation of categorical variables, the chi-square test was employed. Fischer's exact test was applied if the predicted value in any cell of the 2×2 contingency table was less than five. Because there are numerous subgroups in the analysis, significance was determined at the 5% level (P 0.05). The data was examined using EPI Info 6.0 and SPSS 13.0.

Results

Following are the patient distributions by age groups: In contrast, 87 patients (82.8%) were 40 years of age or older, while 18 patients (17.1%) were under that age.

The younger women's median age at diagnosis was 34 years (with a range of 27 to 39 years), while the older women's median age was 53 years (range 40 to 80 years).

Stage distribution of the tumors was as follows:

13 patients (12.3%) were in stage I, 40 (38.1%) in stage II, 47 (44.7%) in stage III, 3 (2.8%) in stage IV, and 2 (1.9%) were not yet in any stage.

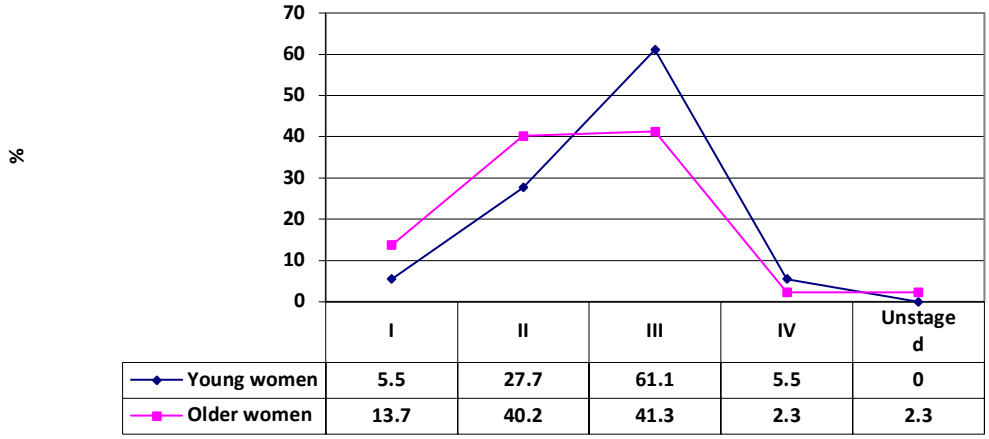
Younger women's tumour features differed significantly from older women's tumour characteristics. As can be shown in Figure 1, younger women had tumours that were more likely to be progesterone receptor positive, larger in size, and in a higher stage (P <0.05). Table 1 lists the tumour features for the two age groups. Compared to 56.3% of the older women, 77.7% of the younger women had positive lymph nodes.

Although this difference was not statistically significant (P = 0.111), it does indicate a rising tendency in patients who are younger. 14 (77.7%) of 18 patients younger than 40 years old had positive progesterone receptor compared with 49 (56.3%) of 87 patients 40 years and older. The differences were statistically significant (*P* <0.05). 92 individuals (87.6%) had invasive ductal carcinoma, the most frequent histologic diagnosis.

Compared to 8 out of 13 individuals (61.5%) with mixed cell and other carcinomas, 55 patients (59.7%) with this histology developed lymph node metastases. Insignificant differences existed (P = 0.90).

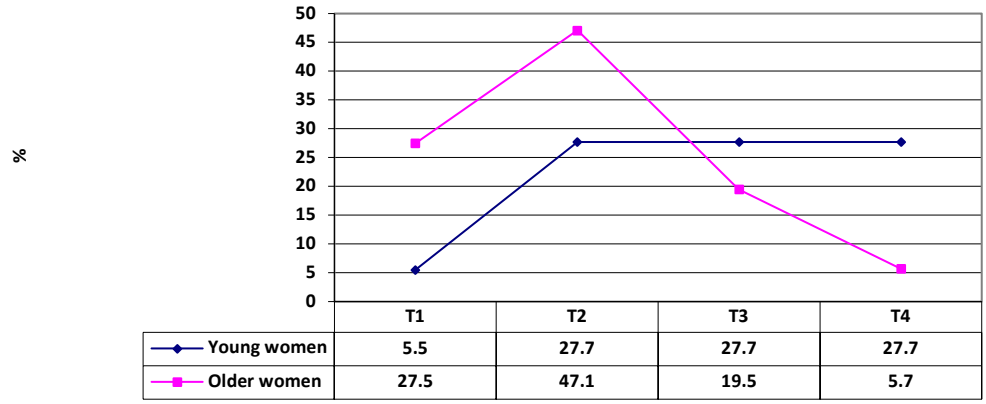
Lymph nodes were implicated in 34 out of 57 oestrogen receptor positive patients (59.6%), compared to 29 out of 48 oestrogen receptor negative patients (60.4%), with no statistically significant difference (P = 0.88).

Compared to 27 out of 42 progesterone receptor negative patients (64.2%), 36 out of 63 progesterone receptor positive patients (57.1%) had lymph node involvement. There was no statistically significant correlation between lymph node involvement and progesterone receptor status (P = 0.42). The relationship between these clinical traits and the lymph node status is shown in Table 2.



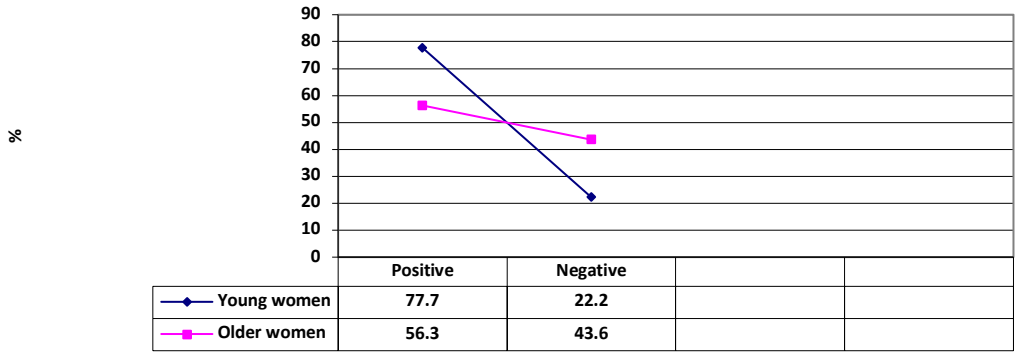
	I	II	III	IV	Unstaged
Young women	5.5	27.7	61.1	5.5	0
Older women	13.7	40.2	41.3	2.3	2.3

Figure 1: A



	T1	T2	T3	T4
Young women	5.5	27.7	27.7	27.7
Older women	27.5	47.1	19.5	5.7

Figure 1: B



	Positive	Negative		
Young women	77.7	22.2		
Older women	56.3	43.6		

Figure 1: C

Figure 1: Younger women had tumors that were more likely to have higher stage (A), larger size (B), and progesterone receptor positive (C).

We looked into the association between HER-2/neu positivity and progesterone receptor status. Negative for progesterone receptor status, HER-2/neu was positive in 38 out of 42 patients (90.4%), whereas progesterone receptor positive patients were positive for HER-2/neu in 47 out of 63

patients (74.6%). HER-2 overexpression was connected statistically significantly with negative progesterone receptor status (P , 0.05). When HER-2/neu expression and oestrogen receptor status were compared, only 38 out of 48 patients with negative oestrogen receptors (79.1%) exhibited positive HER-2/neu, compared to 47 out of 57 patients with positive oestrogen receptors (82.4%). Between the negative and positive oestrogen receptor tumours, there was no statistically significant difference in the prevalence of positive HER-2/neu tumours (Table 3). There was no discernible relationship between the oestrogen receptor, progesterone receptor, P53, or HER-2/neu expression and the positive lymph nodes, size, or stage.

Table 1: Tumor characteristics of the study population

Characteristic	Young women (n=18) No. of patients (%)	Older women (n=87) No. of patients (%)	Chi-square P-value
Tumor characteristics			<0.05
Stage			
I	1(5.5)	12(13.7)	
II	5(27.7)	35(40.2)	
III	11(61.1)	36(41.3)	
IV	1(5.5)	2(2.3)	
Unstaged	0(0.0)	2(2.3)	
Size			<0.05
T1	1(5.5)	24(27.5)	
T2	7(38.8)	41(47.1)	
T3	5(27.7)	17(19.5)	
T4	5(27.7)	5(5.7)	
Estrogen receptor status			0.68
Positive	9(50.0)	48(55.1)	
Negative	9(50.0)	39(44.8)	
Progesterone receptor status			<0.05
Positive	14(77.7)	49(56.3)	
Negative	4(22.2)	38(43.6)	
Nodes involved			0.11
N0	4(22.2)	36(41.3)	
N1	6(33.3)	15(17.2)	
N2	5(27.7)	20(22.9)	
N3	3(16.6)	14(16.0)	
Unknown N	0(0.0)	2(2.3)	
HER-2 status			0.30
Positive	13(72.2)	72(82.7)	
Negative	5(27.7)	15(17.2)	
P53 status			0.42
Positive	5(27.7)	25(28.7)	
Negative	13(72.2)	62(71.2)	

Table 2: Statistical associations between lymph node status with size, histology and hormone receptor status

Pathologic parameters	No. of patients with positive lymph nodes (%)	Chi-square P-value
Tumor size		
T1	11(44.0)	<0.05
T2	28(58.3)	
T3	15(68.1)	
T4	9(90.0)	
Histology		0.90
Invasive ductal carcinoma	55(59.7)	
Invasive mixed cell+others	8(61.5)	
Estrogen receptor status		0.88
Positive	34(59.6)	
Negative	29(60.4)	
Progesterone receptor status		0.42
Positive	36(57.1)	
Negative	27(64.2)	

Table 3: Relation of HER-2/neu expression with hormone receptor status

Hormone receptor	No. of patients with negative HER-2/neu (%)	No. of patients with positive HER-2/neu (%)	Chi-square P-value
Estrogen receptor status			
Positive	10(17.5)	47(82.4)	0.14
Negative	10(20.8)	38(79.1)	
Progesterone receptor status			
Positive	16(25.4)	47(74.6)	<0.05
Negative	4(9.5)	38(90.4)	

Discussion

Age raises the risk of breast cancer. In our study, the prevalence of breast carcinomas among women under the age of 40 was nearly 17%, compared to the 5% to 7% estimated for the United States. Clinically, the association between lymph node involvement and tumour size is well established15, and it stands as the single most potent sign of a bad prognosis for breast cancer.[16,17] Depending on the size of the tumour, estimates for the prevalence of lymph nodes that have been infiltrated by the tumour at the time of diagnosis range from 30% to 50% of cases.[11,13]

The tumours in the younger women were marked by unfavourable biologic characteristics and were obviously distinct from tumours in older women. The considerable within-stage gap between younger and older women is explained by our research's findings. The majority of cancers in younger women had higher stages and positive progesterone receptors. All of these characteristics are associated with more aggressive cancers and a worse prognosis. In accordance with another investigation, malignancies in young women exhibit reduced ER positivity, increased HER-2/epidermal growth factor receptor expression, and a tendency toward worse disease-free survival.[5] These studies all lend credence to the idea that tumours forming in younger women are physiologically distinct from those forming in older women and likely to be more aggressive with negative biologic characteristics.

Numerous studies from both Europe and America have demonstrated that a young age at diagnosis serves as a reliable indicator of poor survival.[18–22] Younger women have a poorer risk factor profile than older women. Compared to older women, young women typically had higher tumour grades, greater tumour volumes, and more positive lymph nodes.[2,4,21,23,24] This topic is still debatable because Chia et al. showed that younger women with breast cancer had better survival rates than older women in a retrospective analysis of breast cancer patients from Singapore.[25] It is also in contrast to our study's result that younger women were more likely to develop progesterone receptor positive tumours. Additionally, based on our findings, tumours with negative progesterone receptors tended to overexpress HER-2. Winstanley et al.[26], like us, did not discover any correlation between oestrogen or progesterone receptor status and lymph node status.

Conclusion

Breast cancer is more aggressive in younger age groups than it is in older age groups. Although HER-2 overexpression was more common in progesterone receptor-negative tumours, progesterone receptor positivity may explain the distinct biologic behaviour of breast cancer in younger age groups.

The relationship between HER-2 expression, hormone receptor status, and lymph node metastases should be the subject of further research.

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