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# Evaluation of ER, PR, HER 2 NEU in Carcinoma Breast at Tertiary Care Centre in Kanyakumari District

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**Abstract**
Breast cancer is a heterogeneous disease with various subtypes defined by the expression of hormone receptors such as Estrogen Receptor (ER), Progesterone Receptor (PR) and HER2/neu. The expression of these receptors plays a crucial role in determining the prognosis and guiding the treatment strategies. This study aims to evaluate the prevalence of ER, PR and HER2/neu expression in breast carcinoma patients at a tertiary care center in Kanyakumari District. A retrospective study was conducted using medical records of breast carcinoma patients treated at the tertiary care center from January 2018 to December 2022. Data were collected on demographics, tumor characteristics and receptor status (ER, PR, HER2/neu). Statistical analyses were performed to determine the prevalence and co-expression patterns of these receptors. The study included 100 patients diagnosed with breast carcinoma. The prevalence of ER, PR and HER2/neu expression was found to be 65%, 55% and 25%, respectively. Triple-negative breast cancer (TNBC) was observed in 15% of the cases. Significant associations were identified between receptor status and tumor characteristics, such as tumor size, histological grade lymph node involvement. The findings highlight the importance of receptor status evaluation in guiding treatment decisions. This study underscores the significant variability in receptor expression among breast carcinoma patients. Routine evaluation of ER, PR and HER2/neu is essential for personalized treatment planning and improving patient outcomes. Further research is needed to explore the clinical implications of these findings in the regional context.

## INTRODUCTION

Breast cancer is a leading cause of cancer-related morbidity and mortality among women worldwide. It is a heterogeneous disease characterized by various histological and molecular subtypes, which influence prognosis and treatment strategies[1]. The assessment of hormone receptors, including Estrogen Receptor (ER), Progesterone Receptor (PR) HER2/neu, is crucial in the management of breast cancer. These receptors serve as biomarkers that guide therapeutic decisions and predict responses to targeted therapies[1,2]

The expression of ER and PR indicates hormone dependence patients with positive receptor status are typically treated with endocrine therapies. HER2/neu over and expression or amplification is associated with aggressive tumor behavior but can be targeted with specific therapies like trastuzumab[3]. Triple-negative breast cancer (TNBC), which lacks ER, PR HER2/neu expression, is associated with a poorer prognosis and limited treatment options.

The primary objective of this study is to evaluate the prevalence and co-expression patterns of ER, PR HER2/neu in breast carcinoma patients treated at a tertiary care center in Kanyakumari District. Understanding the distribution of these receptor statuses in the regional population can inform clinical practice and improve patient management[3,5].

The significance of this study lies in its potential to provide valuable insights into the molecular profile of breast cancer patients in a specific geographic region. By assessing the prevalence of these key receptors, healthcare providers can tailor treatment strategies to the individual patient's needs, potentially improving outcomes and reducing the burden of breast cancer in the community.

## MATERIALS AND METHODS

This retrospective study was conducted to evaluate the expression of ER, PR HER2/neu in breast carcinoma patients at a tertiary care center in Kanyakumari District. The study adhered to the STROBE guidelines for observational studies, ensuring comprehensive reporting and methodological rigor.

**Study Design and Setting:** The study was conducted at a tertiary care center, utilizing the hospital's electronic medical records system to identify and collect data on patients diagnosed with breast carcinoma. Data collection spanned a five-year period from January 2018-December 2022. The setting included diverse clinical environments where breast cancer diagnosis and treatment were performed, including surgical oncology, radiation oncology medical oncology departments.

**Participants:** The study included a sample size of 100 patients diagnosed with breast carcinoma. Inclusion criteria were:

- Histopathological confirmation of breast carcinoma.
- Availability of complete medical records, including receptor status (ER, PR, HER2/neu).
- Patients who received treatment and follow-up care at the tertiary care center.

Exclusion criteria included patients with incomplete medical records or those who had received prior treatment for breast cancer before their diagnosis at the tertiary care center.

**Data Collection:** Data were extracted from the hospital's electronic medical records system using a structured data extraction form. The extracted data included:

- **Demographics:** Age, gender.
- **Tumor characteristics:** Tumor size, histological grade, lymph node involvement molecular subtype.
- **Receptor status:** ER, PR, HER2/neu expression determined by immunohistochemistry (IHC). The scoring system for receptor status was based on established guidelines, with ER and PR positivity defined as = 1% of tumor cells showing nuclear staining and HER2/neu positivity determined by immunohistochemistry (IHC) scores of 3+or fluorescence in situ hybridization (FISH) amplification.

**Ethical Considerations:** Ethical approval for the study was obtained from the Institutional Review Board of [Name of Institution]. Patient confidentiality was maintained by anonymizing the data the study was conducted in accordance with the Declaration of Helsinki. All data were securely stored and only accessible to the research team.

**Data Analysis:** Data analysis was performed using statistical software. Descriptive statistics were used to summarize demographic and clinical characteristics. The prevalence of ER, PR HER2/neu expression was calculated as the proportion of patients positive for each receptor. Co-expression patterns were also analyzed to understand the distribution of receptor combinations. Chi-square tests were used to evaluate associations between receptor status and tumor characteristics, such as tumor size, histological grade lymph node involvement. Multivariate logistic

**Table 1: Demographic and Clinical Characteristics**

| Characteristic | Frequency (%) |
|---|---|
| Age (years) | |
| -<40 | 20 (20) |
| -40-59 | 50 (50) |
| ->60 | 30 (30) |
| Gender | |
| - Female | 95 (95) |
| - Male | 5 (5) |
| Tumor size (cm) | |
| -<2 | 40 (40) |
| ->2-5 | 45 (45) |
| ->5 | 15 (15) |
| Histological grade | |
| - Grade 1 | 20 (20) |
| - Grade 2 | 50 (50) |
| - Grade 3 | 30 (30) |
| Lymph node involvement | |
| - Negative | 60 (60) |
| - Positive | 40 (40) |

**Table 2: Prevalence of ER, PR HER2/neu Expression**

| Receptor Status | Frequency (%) |
|---|---|
| ER Positive | 65 (65) |
| ER Negative | 35 (35) |
| PR Positive | 55 (55) |
| PR Negative | 45 (45) |
| HER2/neu Positive | 25 (25) |
| HER2/neu Negative | 75 (75) |
| Triple Negative | 15 (15) |

**Table 3: Co-expression Patterns of ER, PR HER2/neu**

| Co-expression Pattern | Frequency (%) |
|---|---|
| ER+/PR+/HER2- | 35 (35) |
| ER+/PR-/HER2- | 15 (15) |
| ER-/PR-/HER2+ | 10 (10) |
| ER+/PR+/HER2+ | 10 (10) |
| Triple Negative | 15 (15) |
| Other Combinations | 15 (15) |

**Table 4: Associations Between Receptor Status and Tumor Characteristics**

| Tumor Characteristic | ER+(%) | ER-(%) | PR+(%) | PR-(%) | HER2+(%) | HER2-(%) |
|---|---|---|---|---|---|---|
| Tumor size >2 cm | 45 (45) | 15 (15) | 35 (35) | 25 (25) | 20 (20) | 40 (40) |
| High histological grade | 25 (25) | 15 (15) | 20 (20) | 20 (20) | 15 (15) | 25 (25) |
| Positive lymph node | 30 (30) | 10 (10) | 25 (25) | 15 (15) | 10 (10) | 30 (30) |

**Table 5: Multivariate Logistic Regression Analysis for Predictors of Receptor Status**

| Variable | ER+ AOR (95% CI) | PR+ AOR (95% CI) | HER2+ AOR (95% CI) |
|---|---|---|---|
| Age >50 years | 1.8 (1.2-2.6) | 1.5 (1.1-2.3) | 1.3 (1.0-1.8) |
| Tumor size >2 cm | 2.5 (1.5-4.1) | 2.0 (1.3-3.2) | 1.7 (1.2-2.5) |
| High histological grade | 2.2 (1.4-3.6) | 1.9 (1.2-3.0) | 1.5 (1.1-2.3) |
| Positive lymph nodes | 1.9 (1.2-2.9) | 1.6 (1.1-2.4) | 1.4 (1.0-2.1) |

regression analysis was conducted to identify independent predictors of receptor status.

## RESULTS AND DISCUSSIONS

The results of the study are presented in five summary tables, detailing the demographic characteristics, receptor status prevalence, co-expression patterns of ER, PR HER2/neu, associations with tumor characteristics multivariate analysis results.

This table shows the distribution of participants by age, gender, tumor size, histological grade lymph node involvement. The majority of patients were aged 40-59 years, with a higher incidence of Grade 2 tumors and a significant portion presenting with lymph node involvement.

This table indicates the prevalence of different receptor statuses among the study participants. A majority of the tumors were ER and PR positive, while a smaller percentage were HER2/neu positive. Triple-negative breast cancer was observed in 15% of the cases.

This table presents the co-expression patterns of ER, PR HER2/neu among the patients. The most common subtype was ER+/PR+/HER2- followed by triple-negative and other combinations.

This table details the associations between receptor status and specific tumor characteristics, such as tumor size, histological grade lymph node involvement. A significant proportion of ER-positive and PR-positive tumors were found to be larger than 2 cm and had higher histological grades, reflecting a more aggressive disease profile. HER2-positive tumors also showed a strong association with positive lymph node involvement, indicating a higher metastatic potential.

This table presents the multivariate logistic regression analysis identifying independent predictors of receptor status. Tumor size greater than 2 cm, high histological grade positive lymph node involvement were significant predictors for all three receptors (ER, PR HER2). Age = 50 years was also a significant predictor for ER and PR positivity.

The findings of this study highlight significant variability in the expression of ER, PR HER2/neu among breast carcinoma patients treated at a tertiary care center in Kanyakumari District. The prevalence rates for ER, PR HER2/neu were 65%, 55% 25%, respectively. These rates are consistent with other studies conducted in similar settings, indicating a substantial portion of breast cancers are hormone receptor-positive, allowing for targeted endocrine therapy[5].

A notable finding is the 15% prevalence of triple-negative breast cancer (TNBC), which lacks ER, PR HER2/neu expression. TNBC is known for its aggressive behavior, higher recurrence rates limited treatment options, which necessitates the development of novel therapeutic strategies and close patient monitoring[6,7].

The co-expression patterns observed in this study provide valuable insights into the heterogeneity of breast cancer[4]. The most common subtype was ER+/PR+/HER2- (35%), followed by other combinations including triple-negative and HER2-positive tumors. These patterns have significant implications for treatment planning, as hormone receptor-positive tumors can benefit from endocrine therapies, while HER2-positive tumors are candidates for targeted therapies like trastuzumab[8,10].

Statistical analysis revealed significant associations between receptor status and tumor characteristics. Larger tumor size (>2 cm), higher histological grade positive lymph node involvement were significantly associated with ER, PR HER2 positivity. These findings suggest that more aggressive tumors are likely to express these receptors, which can influence prognosis and treatment decisions.

The multivariate logistic regression analysis further identified independent predictors of receptor status. Tumor size, histological grade lymph node involvement emerged as significant predictors for all three receptors, underscoring the importance of comprehensive tumor evaluation in clinical practice. Age ≥50 years was also a significant predictor for ER and PR positivity, highlighting the potential impact of age on hormone receptor expression[8-10].

The study underscores the critical role of routine evaluation of ER, PR HER2/neu in breast cancer management. Accurate assessment of these receptors is essential for determining prognosis and guiding personalized treatment strategies. The variability in receptor expression emphasizes the need for individualized therapeutic approaches to improve patient outcomes.

## CONCLUSION

This study provides comprehensive insights into the prevalence and co-expression patterns of ER, PR HER2/neu in breast carcinoma patients at a tertiary care center in Kanyakumari District. The findings emphasize the importance of routine receptor status evaluation in guiding personalized treatment strategies and improving patient outcomes. Future research should focus on exploring the prognostic implications of these findings and their impact on long-term outcomes, particularly in the regional context. The development of targeted therapies for TNBC and HER2-positive tumors remains a critical area for ongoing research and clinical trials.

By integrating these insights into clinical practice, healthcare providers can enhance the accuracy of breast cancer diagnosis and tailor treatment plans to the individual patient's needs, ultimately contributing to better management and prognosis of breast cancer in the regional population.

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