

# Biomarkers of Breast Cancer

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**Abstract:** ***Introduction:** Breast cancer treatment has experienced several changes in the past decades due to the discovery of specific prognostic and predictive biomarkers that enable the application of more individualized therapies to different molecular subgroups. This study determined biomarkers of breast cancer. **Material and methods:** This was a hospital based cross sectional observational study conducted for one year from 1st June 2019 to 31st May 2020 in the Department of Pathology, Indira Gandhi Medical College, Shimla. **Results:** 31 (60.8%) cases were ER positive and 20 (39.2%) were ER negative as per Allred Scoring. In our study, 28 (54.9%) cases were PR positive and 23 (45.1%) were PR negative as per Allred Scoring. **Conclusion:** Assessment of ER and PR is important for prognosis.*

**Keywords:** ovarian tumors, benign, malignant, clinical profile

## 1. Introduction

Breast cancer is a complex disease entity with different biological characteristics and clinical behaviour. Many clinical and pathological features have been defined to predict outcome and treatment response in breast cancer. These features include Patient age, tumour stage, axillary lymphnode involvement, lymphovascular invasion, histologic grade, hormonal and human epidermal growth factor receptor (HER-2/neu receptor) status. [1]

Human breast cancer usually depends on sexual hormones for its growth, as it arises from breast tissue that normally responds to endogenous hormones. [2] As in 1896 was firstly noticed that bilateral oophorectomy could induce a significant regression in breast cancer in the fertile age [3], endocrine therapy became quickly a standard of care in the treatment of breast cancer, but only one-third of patients responded.

Then, as in the early 1960s, radiolabeled estrogens were observed to concentrate on specific target organs, the existence of an estrogen receptor (ER) was hypothesized, which could be a predictive factor for the endocrine responsiveness of breast cancer to ovarian ablation. [4, 5]

The present study was undertaken to analyze biomarkers of breast cancer.

## 2. Methods

This was a hospital based observational study conducted for two years from 1st May 2018 to 30th April 2020 in the Department of Pathology, Indira Gandhi Medical College, Shimla. All the proven cases of infiltrating ductal carcinoma of breast (Modified Radical Mastectomy) were considered for study.

Patients were excluded with benign lesions of breast, breast malignancy other than infiltrating duct carcinoma, core needle biopsies/small biopsies, post neo-adjuvant chemotherapy mastectomy specimens, and/or refusal to participate.

Data were presented as frequency and percentages.

Most of the patients (33.3%) were in the 41-50 years age group followed by 25.5% in 61-70 years and 23.5% in 51-60 years age group. Three patients aged above 70 years while six patients aged between 30-40 years.

### Estrogen receptor status

As shown above in Figure 1, 31 (60.8%) cases were ER positive and 20 (39.2%) were ER negative as per Allred Scoring.

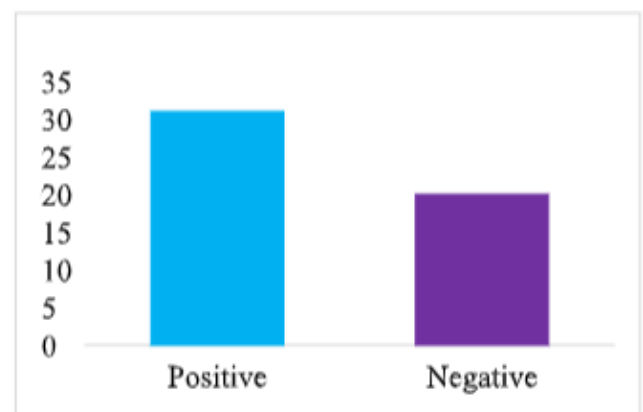


Figure 1: Estrogen receptor status

### Progesterone receptor status

Allred scoring was used to evaluate Progesterone Receptor status. In our study, 28 (54.9%) cases were PR positive and 23 (45.1%) were PR negative as per Allred Scoring. (Figure 2).

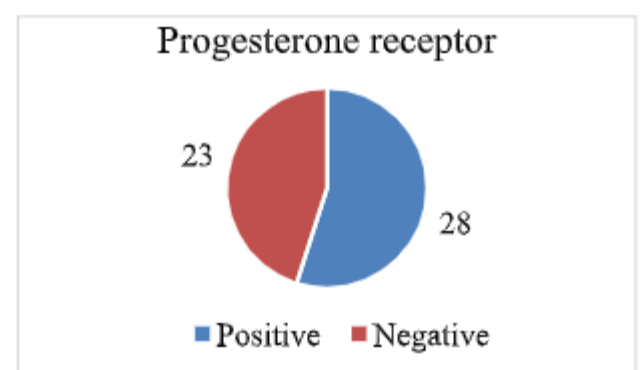


Figure 2: Progesterone receptor

**Combination of ER and PR Status** As evident from figure 3, 24 (47.1%) cases were positive for both ER and PR followed by ER-, PR-in 16 (31.3 %) cases. ER-, PR + were observed in 4 (7.8%) cases of IDC. (Figure 3).

### Triple positive and negative cases

In the present study, 9 (17.6%) cases were found to be Triple Negative and 5 (7.8%) cases were found to be Triple Positive.

### 3. Discussion

ER ( $\alpha$ ) expression is undoubtedly the most important biomarker in breast cancer, because it provides the index for sensitivity to endocrine treatment. ER-positive tumors (c.80% of breast cancer) use the steroid hormone estradiol as their main growth stimulus; ER is therefore the direct target of endocrine therapies. The Oxford overview confirms that patients with ER-negative disease have no benefit from 5-year adjuvant treatment with tamoxifen, but some benefit may be derived in the uncommon group of ER-negative and progesterone receptor (PgR)-expressing breast tumors

The expression of the PgR is strongly dependent on the presence of ER. Tumors expressing PgR but not the ER are uncommon and represent <1% of all breast cancer cases in some large series.<sup>6</sup> For this reason, tumors with PgR expression lacking ER expression should undergo a retesting of their ER status to eliminate false ER negativity. In the rare cases of solely PgR-expressing patients, some limited benefit from tamoxifen is described, but endocrine therapy is still widely recommended.<sup>7</sup>

The oncogene HER2 was first identified to be an indicator of patient's prognosis. In cases of HER2 being overexpressed

(HER2 positive), breast cancer patients are more likely to suffer from relapse and tend to have a shorter overall survival. Amplification of the HER2 gene and RNA/protein overexpression correlate strongly.<sup>8</sup>

### 4. Conclusion

ER+, PR +

ER+, PR-ER-, PR+ ER-, PR

Assessment of ER and PR is important for prognosis and, hence, management. Even with the development of genomic tests, hormone receptor status remains the most significant.

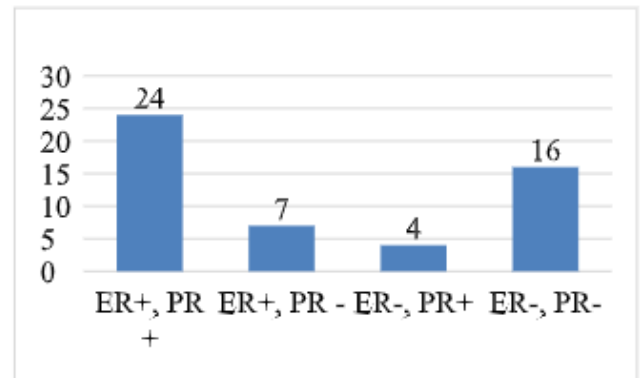


Figure 3: Distribution of malignant tumors

### HER-2/NEU Receptor Status

As evident from figure 4, In our study out of 51 cases of IDC, 11 (21.6%) cases were Her-2/neu positive with a score of 3+ and 40 (78.43%) cases were negative for Her2-neu.

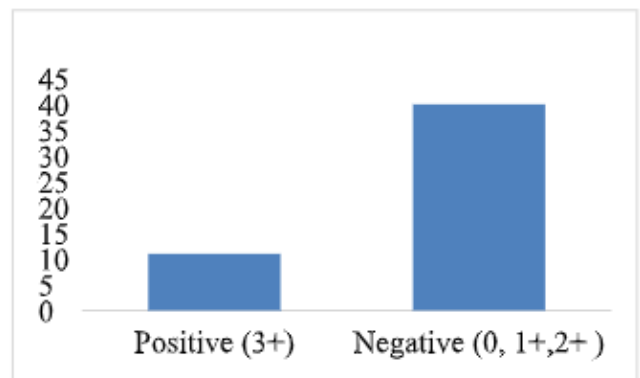


Figure 4: Grading of malignant tumors predictive and prognostic biomarker.

### References

- [1] Yadav BS, Chanana P, Jhamb S. Biomarkers in triple negative breast cancer: A review. *World J Clin Oncol.*2015; 6 (6): 252-263. doi: 10.5306/wjco. v6. i6.252
- [2] Zumoff B, Fishman J, Bradlow HL, Hellman L. Hormone profiles in hormone-dependent cancers. *Cancer Research.*1975; 35: 3365-3373
- [3] Stockwell S. Classics in oncology. George Thomas Beatson, M. D. (1848–1933). CA: A Cancer Journal for Clinicians.1983; 33: 105-121
- [4] Jensen EV, Jordan VC. The estrogen receptor: a model for molecular medicine. *Clinical Cancer Research: An Official Journal of the American Association for Cancer Research.*2003; 9: 1980-1989
- [5] McGuire WL. Current status of estrogen receptors in human breast cancer. *Cancer.*1975; 36: 638-644
- [6] Viale G, Regan MM, Maiorano E, Mastropasqua MG, Dell'Orto P, Rasmussen BB, Raffoul J, Neven P, Orosz Z & Bray S et al.2007 Prognostic and predictive value of centrally reviewed expression of estrogen and progesterone receptors in a randomized trial comparing letrozole and tamoxifen adjuvant therapy for postmenopausal early breast cancer: BIG 1-98. *Journal of Clinical Oncology* 25 3846–3852

- [7] Dowsett M, Houghton J, Iden C, Salter J, Farndon J, A'Hern R, Sainsbury R & Baum M 2006a Benefit from adjuvant tamoxifen therapy in primary breast cancer, International Journal of Pathology Sciences [www.pathologyjournal.net](http://www.pathologyjournal.net) patients according oestrogen receptor, progesterone receptor, EGF receptor and HER2 status. *Annals of Oncology* 17 818–826
- [8] Pegram MD, Konecny G & Slamon DJ 2000 The molecular and cellular biology of HER2/neu gene amplification/overexpression and the clinical development of herceptin (trastuzumab) therapy for breast cancer. *Cancer Treatment and Research* 103 57– 75.