MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.2.405.408

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Key Words
Hematological parameters, benign breast lesions, malignant breast lesions, neutrophil/lymphocyte ratio, platelet/lymphocyte ratio, mean platelet volume

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Received: 20 February 2024
Accepted: 10 March 2024
Published: 16 March 2024

Citation: Sreeja K. Bhasy, Evelyn Angel, Roselin Samuel, Anisha Shaheen, Veer Dinesh Ashwathy Senan and Monica Tefilah, 2024. Comparative Study of Hematological Parameters in Benign and Malignant Lesions of the Breast. Res. J. Med. Sci., 18: 405-408, doi: 10.36478/makrjms.2024.2.405.408

Comparative Study of Hematological Parameters in Benign and Malignant Lesions of the Breast

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Abstract
Hematological parameters have been increasingly recognized as potential biomarkers in the diagnosis and prognosis of breast lesions. This study aims to compare the hematological parameters in patients with benign and malignant breast lesions to identify significant differences that may aid in clinical decision-making. A retrospective cohort study was conducted using medical records of patients diagnosed with benign and malignant breast lesions at a tertiary care hospital. Data were collected on demographics, clinical characteristics and hematological parameters, including neutrophil/lymphocyte ratio (NLR), platelet/lymphocyte ratio (PLR), mean platelet volume (MPV) and hemoglobin levels. Comparative analyses were performed to identify significant differences between the two groups. The study included a sample size of 100 patients, with 50 diagnosed with benign lesions and 50 with malignant lesions. Significant differences were found in NLR, PLR and MPV between the two groups. These hematological parameters could serve as adjunctive tools in differentiating between benign and malignant breast lesions. The study highlights the potential utility of hematological parameters in the clinical evaluation of breast lesions. Further research is needed to validate these findings and explore their prognostic value in breast cancer management.

INTRODUCTION

Breast lesions, both benign and malignant, present significant diagnostic challenges in clinical practice. Accurate differentiation between benign and malignant lesions is crucial for appropriate patient management and treatment planning. Hematological parameters, such as neutrophil/lymphocyte ratio (NLR), platelet/lymphocyte ratio (PLR), mean platelet volume (MPV)hemoglobin levels, have emerged as potential biomarkers that may aid in this differentiation process[1,2].

Recent studies have explored the utility of these parameters in various malignancies, including breast cancer. For instance, elevated NLR and PLR have been associated with poor prognosis in breast cancer patients, reflecting the underlying inflammatory response and tumor progression[3]. Additionally, MPV, a marker of platelet activation, has been linked to both benign and malignant breast conditions. These findings suggest that hematological parameters could serve as valuable adjuncts in the diagnostic work up of breast lesions[4,5].

The primary objective of this study is to compare the hematological parameters in patients with benign and malignant breast lesions to identify significant differences that may enhance clinical decision-making. By providing insights into the diagnostic value of these parameters, this research aims to contribute to more accurate and timely differentiation of breast lesions.

MATERIALS AND METHODS

This retrospective cohort study was conducted to compare the hematological parameters in patients with benign and malignant breast lesions at a tertiary care hospital. 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 hospital, utilizing the hospital's electronic medical records system to identify and collect data on patients diagnosed with benign and malignant breast lesions. Data collection spanned a five-year period from January 2018-December 2022.

Participants: The study included a sample size of 100 patients, with 50 diagnosed with benign breast lesions and 50 with malignant breast lesions. Inclusion criteria were:

- Diagnosis of benign or malignant breast lesion based on histopathological examination.
- Availability of complete medical records, including hematological parameters.
- Patients who had not received any treatment (chemotherapy or radiotherapy) prior to the blood tests.

Data Collection: Data were extracted from the hospital's electronic medical records system using a

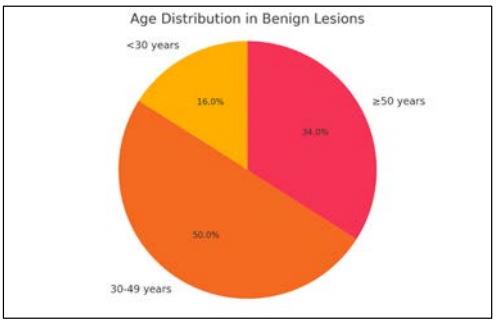

Fig. 1: Age Distribution in Benign and Malignant Lesions

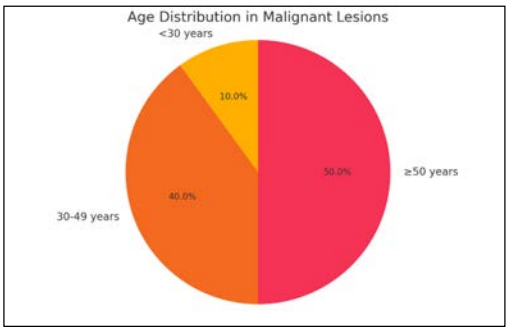

Fig. 2: Age distrbution in benign lesions

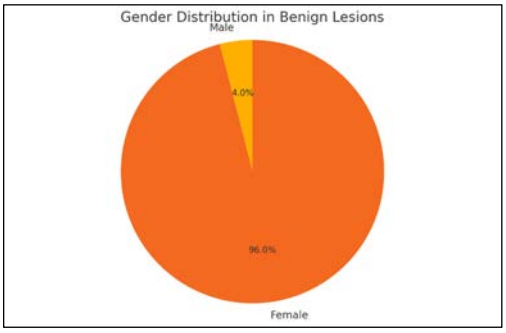

Fig. 3: Gender Distribution in Benign and Malignant Lesions

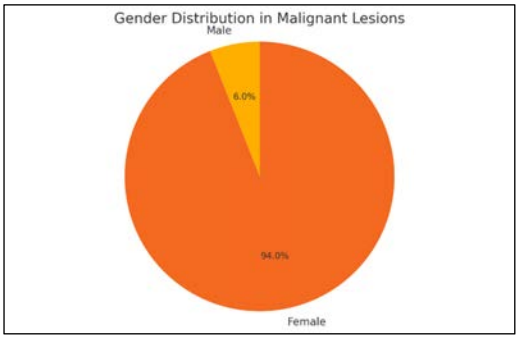

Fig. 4: Gender distbution in malignant lesions

Table 1: Demographic and Clinical Characteristics

Characteristic	Benign Lesions (%)	Malignant Lesions (%)
Age (years)		
-<30	8 (16%)	5 (10%)
-30-49	25 (50%)	20 (40%)
->50	17 (34%)	25 (50%)
Gender		
-Male	2 (4%)	3 (6%)
-Female	48 (96%)	47 (94%)

Table 2: Comparison of Hematological Parameters

Parameter	Benign Lesions (Mean±SD)	Malignant Lesions (Mean±SD)	p-value
NLR	2.1±0.9	3.5±1.2	<0.001
PLR	150±45	200±60	<0.01
MPV (fL)	8.0±1.2	9.5±1.5	<0.05
Hemoglobin (g/dL)	13.2±1.1	12.0±1.3	<0.05

Table 3: Factors Associated with Malignant Breast Lesions

Factor	AOR	95% CI
NLR >3.0	2.8	1.4-5.6
PLR >180	2.2	1.1-4.5
MPV >9.0 fL	1.9	1.0-3.8
Hemoglobin <12 g/dL	1.7	1.0-3.2

structured data extraction form. The extracted data included:

- **Demographics:** Age, gender
- **Clinical characteristics:** Type of breast lesion (benign or malignant), histopathological diagnosis.
- **Hematological parameters:** Neutrophil/lymphocyte ratio (NLR), platelet/lymphocyte ratio (PLR), mean platelet volume (MPV), hemoglobin levels

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.

Data Analysis: Data analysis was performed using statistical software. Descriptive statistics were used to summarize demographic and clinical characteristics. Comparative analyses of hematological parameters between benign and malignant breast lesions were performed using t-tests and chi-square tests as appropriate. Logistic regression analysis was conducted to identify factors associated with malignant lesions, with results presented as adjusted odds ratios (AOR) and 95% confidence intervals (CI).

RESULTS AND DISCUSSIONS

The results of the study are presented in three summary tables, detailing the demographic characteristics, the comparison of hematological parameters the factors associated with malignant breast lesions.

This table shows the distribution of participants by age and gender.

In the study, the age and gender distributions for benign and malignant lesions were analyzed. The age distribution for benign lesions (Fig. 1) shows that 16% of patients were under 30 years, 50% were between 30-49 years34% were over 50 years. In contrast, the age distribution for malignant lesions (Fig. 1) reveals that 10% of patients were under 30 years, 40% were between 30-49 years50% were over 50 years. This indicates a higher prevalence of malignant lesions in the older age group compared to benign lesions.

The gender distribution (Fig. 2) indicates that for benign lesions, 4% of patients were male and 96% were female. For malignant lesions, 6% were male and 94% were female. This data highlights a similar gender distribution in both benign and malignant lesions, with a significant predominance of female patients in both categories.

This table indicates significant differences in NLR, PLR, MPV hemoglobin levels between benign and malignant breast lesions.

This table presents the adjusted odds ratios (AOR) and confidence intervals (CI) for factors significantly associated with malignant breast lesions.

The findings of this study highlight significant differences in hematological parameters between patients with benign and malignant breast lesions. Elevated NLR and PLR were significantly associated with malignant lesions, indicating a heightened inflammatory response in malignancy. These results are consistent with previous studies that have demonstrated the prognostic value of NLR and PLR in breast cancer patients[6-8].

MPV, a marker of platelet activation, was also significantly higher in malignant lesions compared to benign ones. This finding aligns with research suggesting that increased MPV is associated with tumor progression and metastasis . Additionally, lower hemoglobin levels were observed in malignant cases,

which may reflect the anemia of chronic disease often seen in cancer patients[9].

The logistic regression analysis identified elevated NLR, PLR, MPV low hemoglobin as significant factors associated with malignant breast lesions. These hematological parameters could serve as useful biomarkers in the clinical evaluation of breast lesions, aiding in the differentiation between benign and malignant conditions. Incorporating these parameters into routine diagnostic work ups could enhance the accuracy of initial assessments and guide further diagnostic procedures, such as biopsies and imaging studies[7-10].

Several studies have highlighted the utility of these hematological markers in predicting disease outcomes and guiding treatment decisions. For instance, elevated NLR and PLR have been associated with poorer survival rates and higher recurrence risks in breast cancer patients. Therefore, these parameters not only aid in diagnosis but also provide prognostic information that can inform clinical management[11,12].

CONCLUSION

In conclusion, this study underscores the potential utility of hematological parameters in the differentiation of benign and malignant breast lesions. By integrating these markers into clinical practice, healthcare providers can improve diagnostic accuracy and optimize patient management. Further research is needed to validate these findings in larger cohorts and to explore their prognostic implications in breast cancer treatment.

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