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# STUDY OF PLATELET COUNT WITH INDICES IN NON-HEMATOLOGICAL MALIGNANCIES IN A TERTIARY CARE HOSPITAL OF SOUTHERN ASSAM.

Pathology

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## ABSTRACT

**Background:** Platelets, also referred to as thrombocytes, originates in bone marrow and is the second most numerous blood cells which circulate in blood and play a crucial role in hemostasis, wound healing and angiogenesis. Thrombocytosis has been linked with cancer progression and mortality for various cancers. In certain malignancies, an increased platelet count has been observed and has been related to disease stage, tumor histology and patient survival. This study aims to analyze the platelet count and platelet indices in patients newly diagnosed with non-hematological malignancies as well as to assess the correlation between lymph mode metastasis and elevated platelet count. **Materials And Methods-** The study was conducted on a total of 120 cases of non-hematological malignancies for over a period of one year from both the cytology and histology section of Silchar medical college and hospital. **Results-** Out of the 120 cases, Carcinoma breast 25%, Carcinoma oral cavity 15.83% and Carcinoma cervix 15% is most common. 26.66% were found to be associated with thrombocytosis. 27.5% had lymph node metastasis at the time of presentation. Out of those 27.5% of lymph node metastasis, most of the cases had thrombocytosis. In our study, mean platelet volume (MPV) and Platelet distribution width (PDW) are not altered but Platelet count (PC) and Plateletcrit (PCT) are elevated in most of the cases of non-hematological malignancies. **Conclusion-** The measurement of platelet and its indices is a clinical marker useful to define the prognosis for patients with non-hematological malignancy. Further studies are needed to validate their clinical significance and establish their role in disease management.

## KEYWORDS

platelet indices, non-hematological malignancy, platelet count, mean platelet volume, platelet distribution width, Plateletcrit.

## INTRODUCTION:

Platelets, also known as thrombocytes, are tiny, membrane bound fragments of cytoplasm, that play a major role in hemostasis and thrombosis. They are derived from megakaryocytes in the bone marrow and has a lifespan of approximately 7-10 days in the peripheral circulation [1]. Platelet indices include platelet count (PC), mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT), provide valuable information about platelet production, size and function [2]. Thrombocytosis refers to a platelet count above the normal range. With the widespread use of electronic cell counters and the subsequent availability of a platelet count as part of a 'routine' blood count, thrombocytosis is more often observed as an unexpected finding. Thus, an elevated platelet count has become an important clinical problem for differential diagnosis. The association of thrombocytosis with malignancies has been known for more than 100 years now [3]. Thrombocytosis was reported in patients with lung [4], colon [4], renal cell carcinomas [5], cervical cancers [6,7], ovarian cancers [8], and vulval cancers [9]. Despite the potential clinical utility of platelet indices, their interpretation should be done cautiously. Platelet indices can be affected by various pre-analytical and analytical factors, such as anticoagulant used, time delay between blood collection and analysis, and the type of hematology analyzer employed [10]. Moreover, the reference ranges for platelet indices may vary depending on the population studied and the laboratory methods used [11]. Platelet indices provide valuable insights into platelet production, size and function. Alterations in platelet indices have been reported in various hematological and non-hematological conditions and may serve as a potential biomarker for diagnosis, prognosis, and monitoring.

### Aim:

The main aim of this study was to analyze the platelet count and platelet indices in patients newly diagnosed with non-hematological malignancies and to see the association of lymph node metastasis with high platelet count in a tertiary care hospital in southern Assam.

## MATERIALS AND METHODS:

This study was a hospital-based prospective study, including a final sample size of 120 patients. Conducted over a period of one year from September 2023 to August 2024 in the department of pathology, Silchar Medical College and Hospital. Eligible participants included patients newly diagnosed with non-hematological malignancy in histopathology and cytopathology section of department of pathology, SMCH and Patients presenting with metastatic lymph nodes. Ethical committee clearance was obtained and for each subject, consent was taken and the Complete blood counts (CBC) were performed using an automated five-part hematology analyzer. The analyzer was calibrated daily, and quality control measures were undertaken to ensure the accuracy and precision of the results. Platelet indices were obtained from the CBC reports, and the reference ranges for each parameter were as follows: PC (150-450 × $10^9$/L), MPV (7.5-11.5 fL), PDW (10-17%), and PCT (0.22-0.24%). Patients in the pediatric age group, Patients with bleeding and coagulative disorders, Patients diagnosed with hematological malignancies and Patients who are receiving or has received any chemotherapy or radiotherapy were excluded from the study.

## RESULTS:

A total of 120 patients, newly diagnosed with non- hematological malignancy was observed during the study period. Majority of the cases were between 57-75 years (46.7%) and 38-56 years (38.3%) (Table I). There were 51 male patients (42%) and 69 patients (58%) who were female. The ratio of male to female was 1:1.3 (Table II)

**Table I: Number Of Cases In Relation To Age Group**

| AGE (in years) | NUMBER(n=120) | % |
|---|---|---|
| 19-37 | 14 | 11.6 |
| 38-56 | 46 | 38.3 |
| 57-75 | 56 | 46.7 |
| 76-94 | 04 | 3.3 |

**Table II: Distribution Of Cases According To Gender.**

| GENDER | NUMBER (n=120) |
|---|---|
| MALE | 51 |
| FEMALE | 69 |

Among the malignancies, carcinoma breast (25%), metastatic lymph node (19.2%), carcinoma oral cavity (15.8%), carcinoma cervix (15%), laryngeal and pharyngeal carcinoma (5%), carcinoma thyroid carcinoma lower GIT (4.16%) , penile carcinoma (3.3%), carcinoma

Gb (2.5%), carcinoma omentum, eyelid carcinoma (1.7%) , carcinoma mandible and gastric carcinoma (0.8%) were the types of non-hematological malignant lesions (Table III).

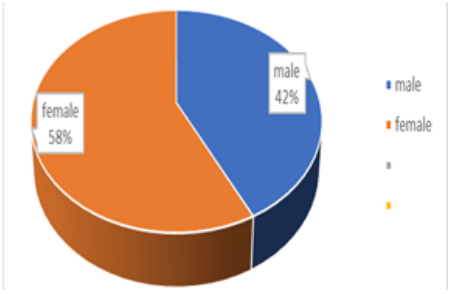


**Table III : Distribution of the non-hematological malignant lesion in the patient group (n=120)**

| DISEASE | NUMBER (n=120) | % |
|---|---|---|
| Carcinoma breast | 30 | 25 |
| Metastatic lymph node | 23 | 19.2 |
| Carcinoma oral cavity | 19 | 15.8 |
| Carcinoma cervix | 18 | 15 |
| Carcinoma larynx and pharynx | 06 | 05 |
| Carcinoma thyroid | 05 | 4.2 |
| Carcinoma lower GIT | 05 | 4.2 |
| Carcinoma penis | 04 | 3.3 |
| Carcinoma gall bladder | 03 | 2.5 |
| Carcinoma omentum | 02 | 1.7 |
| Carcinoma eyelid | 02 | 1.7 |
| Carcinoma mandible | 01 | 0.8 |
| Carcinoma stomach | 01 | 0.8 |

Among the malignancies, carcinoma breast (31.3%), carcinoma cervix (21.9%), carcinoma oral cavity (18.8%), metastatic lymph node (9.4%), laryngeal and pharyngeal carcinoma (6.3%) and carcinoma lower GIT (6.3%) each respectively, penile carcinoma (3.1%) and carcinoma omentum(3.1%) each respectively were found to be associated with thrombocytosis (Table IV).

**Table IV: Malignant lesions showing thrombocytosis in the patient group**

| DISEASE | NUMBER | % |
|---|---|---|
| Carcinoma breast | 10 | 31.3 |
| Metastatic lymph node | 03 | 9.4 |
| Carcinoma oral cavity | 06 | 18.8 |
| Carcinoma cervix | 07 | 21.9 |
| Carcinoma larynx and pharynx | 02 | 6.3 |
| Carcinoma Thyroid | 00 | 00 |
| Carcinoma lower GIT | 02 | 6.3 |
| Carcinoma Penis | 01 | 3.1 |
| Carcinoma gall bladder | 00 | 00 |
| Carcinoma omentum | 01 | 3.1 |
| Carcinoma eyelid | 00 | 00 |
| Carcinoma mandible | 00 | 00 |
| Carcinoma stomach | 00 | 00 |

Most of the cases (80 out of 120 or 66.66%) showed a platelet count of 1.5 -4.5 lakhs/cumm & Only 32/120 (26.66%) cases showed platelet count of >4.5 lakhs/cumm (Table V).

**Table V : Distribution Of Platelet Count In The Patient Group.**

| Platelet count $\times 10^3$ /mm3 | NUMBER | % |
|---|---|---|
| <1.5 | 08 | 6.7 |
| 1.5-4.5 | 80 | 66.7 |
| >4.5 | 32 | 26.7 |

118 cases out of 120 had Mean Platelet Volume (MPV) within normal range, 114 cases showed a Platelet Distribution Width (PDW) within normal range while 67 cases showed an increase in the Plateletcrit (PCT) value (Table VI).

**Table Vi : Distribution Of Platelet Indices In The Cases (n=120)**

| Platelet indices | Normal limit | Elevated |
|---|---|---|
| MPV | 118 | 02 |
| PDW | 114 | 06 |
| PCT | 53 | 67 |

Most of the cases (87 out of 120 or 72.5%) did not have lymph node metastasis. Only (33 out of 120 or 27.5%) cases showed lymph node metastasis (Figure I & figure II)

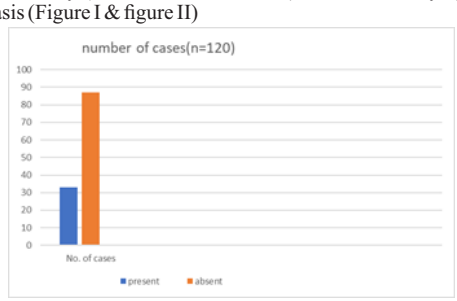


**Figure I :** Lymph Node Metastasis (At the time of Presentation)

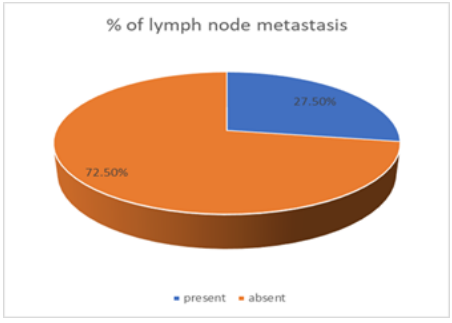


**Figure II:** Lymph Node Metastasis (at the time of presentation) in percentage

Out of the 33 positive cases of lymph node metastasis, 18 cases showed thrombocytosis while out of the total 87 cases of no lymph nodes metastasis ,14 cases showed thrombocytosis (Table VII).The chi-square seems to be 18.10 & the p-value is <0.000021, which is statistically significant.

**Table VII : Distribution Of Cases Showing Association Between Lymph Node Metastasis And Thrombocytosis.**

| Lymph node metastasis | Thrombocytosis (PLT>450×109/l) | Without thrombocytosis (PLT≤450×109/l) |
|---|---|---|
| Yes (33) | 18 | 15 |
| No (87) | 14 | 73 |

Most of the cases (30 out of 33) of lymph node metastasis showed Mean Platelet Volume (MPV) value within normal range.31 out of 33 lymph node metastasis cases showed Platelet Distribution Width (PDW) value within normal range and 30 positive lymph node cases out of the 33 showed increased Plateletcrit (PCT) value (Table VIII). The chi-square is 66.85 and p-value is <0.00001, which is statistically significant.

**Table VIII : Distribution Of Cases Showing Association Between Lymph Node Metastasis And Platelet Indices, (n=33).**

| PLATELET INDICES | NORMAL RANGE | ELEVATED |
|---|---|---|
| MPV (9.6-13.1) | 30 | 03 |
| PDW (9.3-17.3) | 31 | 02 |
| PCT (0.22-0.24) | 03 | 30 |

**DISCUSSION**:

Given the significant role of platelets, thrombocytosis can serve as a pathological indicator for malignancy diagnosis. In our study, thrombocytosis was most frequently observed in carcinoma breast (31.3%), carcinoma cervix (21.9%), carcinoma oral cavity (18.8%), metastatic lymph node (9.4%), laryngeal and pharyngeal carcinoma (6.3%) and carcinoma lower GIT (6.3%) each respectively, penile carcinoma (3.1%) and carcinoma omentum (3.1%) each respectively. These findings align with those of Levine S.P. et al., who also reported a strong association between malignancies and thrombocytosis [12].

Our research explored the relationship between thrombocytosis and neoplastic conditions. While several studies support the idea that platelet counts increase across different organ cancers, some research suggests no significant change in colon cancer, breast carcinoma, and gastric cancer [13-15].

The connection between platelets and cancer progression suggests that their role extends beyond hemostasis. Platelets release various cytokines and growth factors, including transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), matrix metalloproteinase-2 (MMP-2), platelet factor-4, and platelet-derived growth factor (PDGF), which contribute to key cancer hallmarks such as epithelial–mesenchymal transition (EMT), angiogenesis, cell migration, and tumor proliferation. Additionally, platelets facilitate the retention of tumor emboli within microcirculation [16]. They also promote cancer progression by stimulating the release of pro-inflammatory cytokines (IL-1, IL-3, and IL-6) by tumor cells [17]. This highlights their multifunctional role in cancer development.

Our findings showed a strong association between thrombocytosis and oral cavity carcinoma, lung carcinoma, and breast malignancies, which is consistent with studies by Kannar V., Raja V., Suresh T.N. et al. [18], Patel A., Abdeen Y. et al. [19], and Harano K., Kogawa T. et al. [20], who identified platelet count as a prognostic marker in breast carcinoma. Thrombocytosis has emerged as a universal indicator of adverse cancer outcomes, with its association reported in early and advanced breast cancer, ovarian cancer, genitourinary cancers, and several other malignancies.

Our study found that among 120 cases, 33 cases presented with lymph node metastasis at the time of diagnosis. Of these, 18 cases exhibited thrombocytosis, while 15 cases did not, a difference that was statistically significant ($p < 0.000021$). These findings are in agreement with the study conducted by Chen et al., which also highlighted a significant correlation between thrombocytosis and lymph node metastasis.

In our study, Mean Platelet Volume (MPV) and Platelet Distribution Width (PDW) remained unchanged, whereas Platelet Count (PC) and Plateletcrit (PCT) were elevated in cases of non-hematological malignancies, regardless of the presence of lymph node metastasis. This difference was found to be statistically significant ($p = 0.00001$) and aligns with the findings of Khemka R. et al.

## CONCLUSION:

Thrombocytosis has been identified in various malignancies, with multiple studies suggesting that an elevated platelet count could serve as a potential marker for cancer diagnosis and prognosis. Its presence in different cancers has been associated with poorer survival outcomes, independent of other clinical or biochemical parameters. Further research is necessary to establish thrombocytosis as a reliable prognostic factor, which may contribute to improved risk stratification in future clinical trials. Additionally, large-scale studies are needed to assess the clinical utility of platelet indices in cancer diagnosis, recurrence prediction, and treatment monitoring.

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