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Original Research Article

Evaluation of Platelet Indices in Distinguishing Types of Thrombocytopenia

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Abstract

Platelets originate from cytoplasmic fragmentation of mature megakaryocytes, these are essential for maintaining hemostasis balance, regulating inflammatory response, and immune response and wound healing. A platelet count of less than 150 x 10^9/L is an indicative of thrombocytopenia , which can result of either impaired platelet production (hypo proliferative) or increased platelet destruction (hyper destructive). Bone marrow examination is the definitive method in distinguishing between hypo proliferative and hyper destructive thrombocytopenia, but its invasive nature and associated bleeding makes it less desirable option for patients .In contrast ,evaluating platelet indices is less invasive, simpler and effective method for distinguishing types of thrombocytopenia. The platelets indexes that can be used are Plateletcrit (PCT), Mean Platelet Volume (MPV) ,Platelet Large Cell Ratio(P-LCR) and Platelet Distribution Width (PDW). This study seeks to evaluate values of platelet indices in differentiating between various types of thrombocytopenia, thereby help in diagnosis and management. To determine the role of platelet indices in discriminating hypo proliferative and hyper destructive type of thrombocytopenia and to determine platelet indices in various causes in thrombocytopenia disorders. A prospective study of 62 patients with thrombocytopenia was done a period of six months in department of pathology, to determine type of thrombocytopenia based on platelet indices. All 62 cases data were entered into a Microsoft Excel spreadsheet, then analyzed using SPSS Statistics version 22. Quantitative data were summarized as mean ± standard deviation or median with range, depending on distribution. Qualitative variables were assessed using the chi-square test, with statistical significance set at $p < 0.05$.31cases were classified as hyperdestructive thrombocytopenia and 31 cases as hypoproliferative thrombocytopenia. 35 males and 27 females. Among those with hyperdestructive thrombocytopenia, 61.3% were males and 38.7% were females. On comparing platelet parameters between the two groups, the mean platelet count in the hyperdestructive group was 90354.839±35465.052/cumm, whereas in the hypoproliferative group it was slightly lower 95451.613±35647.196 /cumm. This difference was not statistically significant ($p = 0.4682$). Statistically significant difference was observed in the platelet large cell ratio (P-LCR), which was higher in hyper destructive thrombocytopenia (32.616±9.008)compared to hypo proliferative thrombocytopenia (28.139±7.832), with a p-value of 0.03.The mean platelet volume (MPV) was significantly higher in hyperdestructive thrombocytopenia at 11.17 fL compared to 10.48 fL in hypo proliferative thrombocytopenia ($p=0.009$).

MPV and P-LCR are greatly elevated in hyper destructive thrombocytopenia and are excellent markers in differentiating the types of thrombocytopenia. Their application in routine examination can be useful in early diagnosis, but they need to be confirmed through large-scale studies.

Keywords: Hypo Proliferative Thrombocytopenia, Hyper Destructive Thrombocytopenia, Platelet Indices.
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Introduction

Platelets originate from cytoplasmic fragmentation of mature megakaryocytes. These are essential for maintaining hemostasis balance, regulating inflammatory response, immune response, wound healing, and supporting angiogenesis. [1] Platelet count of less than 150 x 109/L is indicative of thrombocytopenia, which can result from either impaired platelet generation (hypo proliferative) or elevated platelet destruction (hyper destructive). [2] Bone marrow examination is the definitive method in distinguishing between hypo proliferative and hyper-destructive thrombocytopenia, and its invasive nature and associated bleeding make it a less desirable option for patients. In contrast, evaluating platelet indices is less invasive, simpler and effective method for distinguishing types of thrombocytopenia. [4] The platelet indices that can be used are Plateletcrit (PCT), Mean Platelet

Volume (MPV), Platelet Large Cell Ratio (P-LCR), and Platelet Distribution Width (PDW).MPV has been found useful in distinguishing between hyperproliferative and hyperdestructive thrombocytopenia, with higher MPV values suggesting increased megakaryocyte activity and lower values indicating bone marrow suppression, but a definitive cut-off value has not been determined. [5] This research seeks to assess values of platelet indices in differentiating between various types of thrombocytopenia, thereby helping in diagnosis and management, as many studies have focused on evaluating a single platelet index, such as MPV, or compared within a single disease category. This highlights the need for comprehensive study for examining utility of platelet indices in distinguishing types of thrombocytopenia.

Objectives: The present study was done to determine the role of platelet indices in discriminating hypo proliferative and hyper destructive type of thrombocytopenia. Additionally, the study aimed to evaluate platelet indices across various causes of thrombocytopenic disorders.

Materials and Methods

This prospective study was conducted at Department of pathology, over a 6 months period (January 2025-June 2025), following Institutional Ethics Committee Clearance. Study included 62 cases of thrombocytopenia. Blood samples which collected in di – potassium EDTA (ethylenediamine tetra acetic acid), complete blood count (CBC) analysis is done. Samples with platelet count lesser than 1,50,000 cells/cumm is selected and consent is taken from the cases. Relevant clinical history was collected. Standard platelet indices such as platelet count (1.5-4 lakh/cumm), PCT (0.15-0.3%),PDW (9 to 15 fL), MPV (8 to 12fL) and P-LCR(18-50 %) will be measured using automated blood cell analyzer (SYSMEX XN 1000). Diseases categories is based on the international classification of diseases, tenth revision (ICD -10) category.

Exclusion Criteria: Patients on antiplatelet medications or other therapies associated with pregnant females, thrombocytopenia, alongside patients who underwent significant surgery within preceding month.

Statistical Analysis: All data will be encoded and input into a Microsoft Excel data sheet moreover analysed employing SPSS vr. 22 software. Quantitative data would be presented as median with range or mean±SD. Qualitative data will undergo analysis utilizing chi-square test. P< 0.05 would be deemed statistically significant.

Results

A total of 62 cases were analyzed. Among them, 31 (50%) were Hyperdestructive thrombocytopenia and 31 (50%) were Hypoproliferative thrombocytopenia cases (Fig 1).

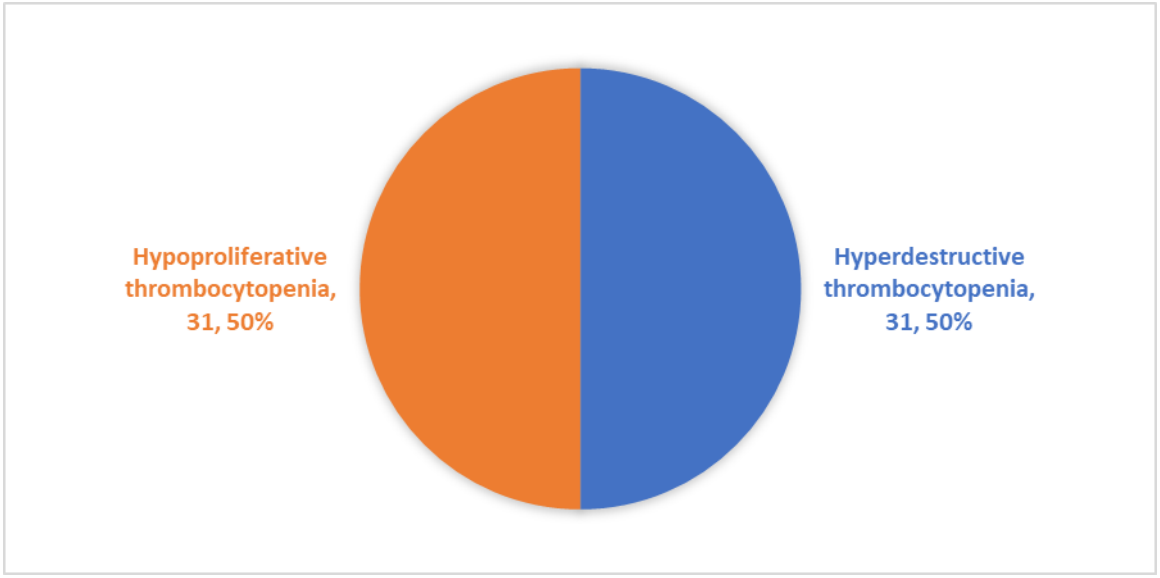


Figure 1: Types of thrombocytopenia

A total of 35 male and 27 female participants were included in the study (Fig 2)

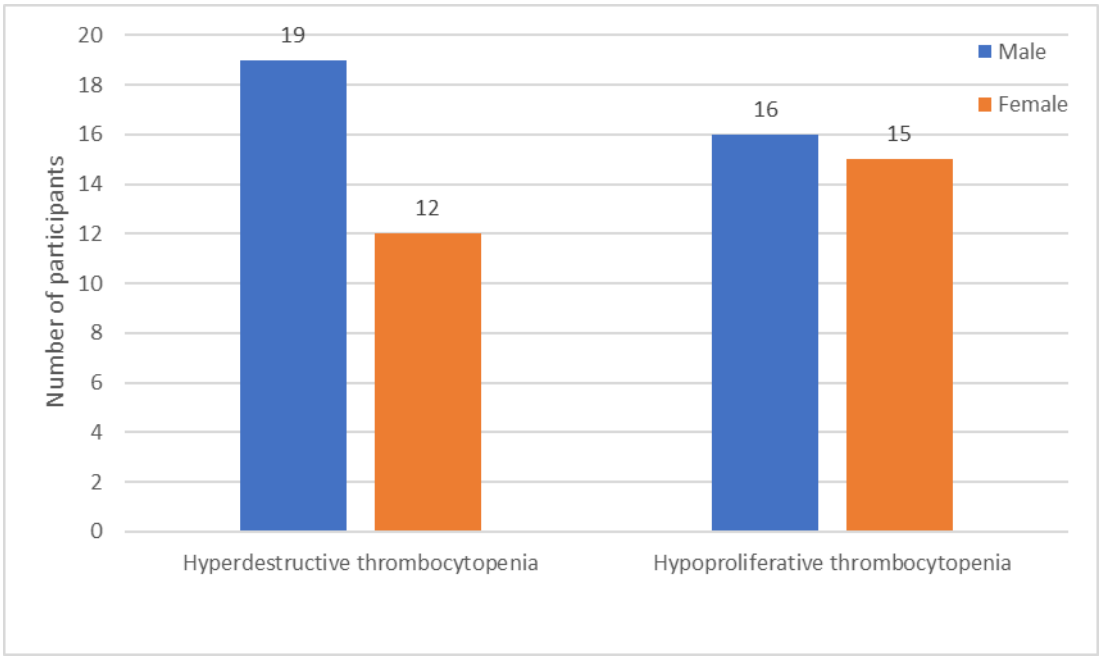


Figure 2: Gender distribution of cases of thrombocytopenia

Table 1: Gender distribution of cases of thrombocytopenia

Type of thrombocytopenia	Male	Female	Grand Total
Hyperdestructive thrombocytopenia (%)	19(61.3%)	12(38.7%)	31
Hypoproliferative thrombocytopenia (%)	16(51.6%)	15(48.4%)	31
Grand Total	**35**	**27**	**62**

The median age of the participants was 52 years, and ranged from 16 years to 82 years. The median age of participants with hyperdestructive thrombocytopenia was 48 years, and ranged from 16 to 72 years. The median age of participants with hypoproliferative thrombocytopenia was 53 years, and ranged from 16 to 85 years. The clinical diagnosis of the participants is given in Table 2.

Table 2: Hyperdestructive thrombocytopenia

Hyperdestructive thrombocytopenia	**31**
Dengue	6
Febrile Thrombocytopenia	1
Fever	13
IDA	1
ITP	1
PTB	1
SEPSIS	6
Severe Anemia	2
Hypoproliferative thrombocytopenia	**31**
AML	1
CLL	2
CML	2
Palliative/Chemotherapy	20
Pancytopenia	6
Grand Total	**62**

Various platelet parameters in either type of thrombocytopenia are given in the table below.

Table 3: Distribution of Thrombocytopenia Cases by Etiology and Pathophysiological Category

Parameter	Type of thrombocytopenia	N	p value
Platelet count (lakhs /cumm)	Hyperdestructive thrombocytopenia	31	p = 0.4682
	Hypoproliferative thrombocytopenia	31	
PCT(%)	Hyperdestructive thrombocytopenia	31	p=0.339
	Hypoproliferative thrombocytopenia	31	
P-LCR(%)	Hyperdestructive thrombocytopenia	31	p=0.03
	Hypoproliferative thrombocytopenia	31	
PDW(um3)	Hyperdestructive thrombocytopenia	31	p= 0.422
	Hypoproliferative thrombocytopenia	31	
MPV(um3)	Hyperdestructive thrombocytopenia	31	p=0.009
	Hypoproliferative thrombocytopenia	31	

Since the data is skewed, non-parametric tests were used for comparison of median of different parameters in the two types of thrombocytopenia. Significant difference was noticed in P-LCR (%), MPV (um3) of hyperdestructive and hypoproliferative thrombocytopenia (p=0.03, p=0.009).

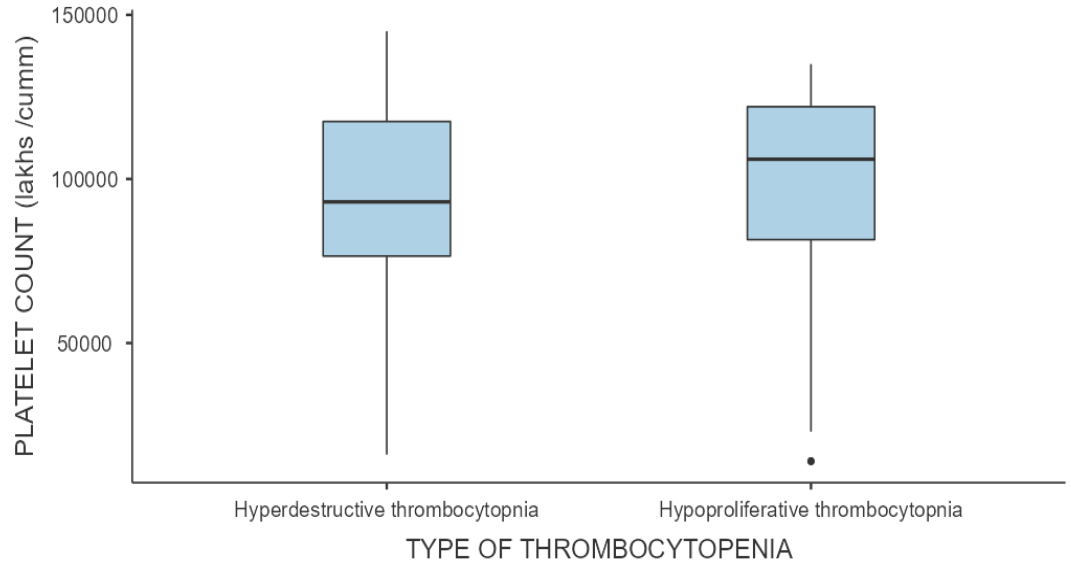


Figure 3:

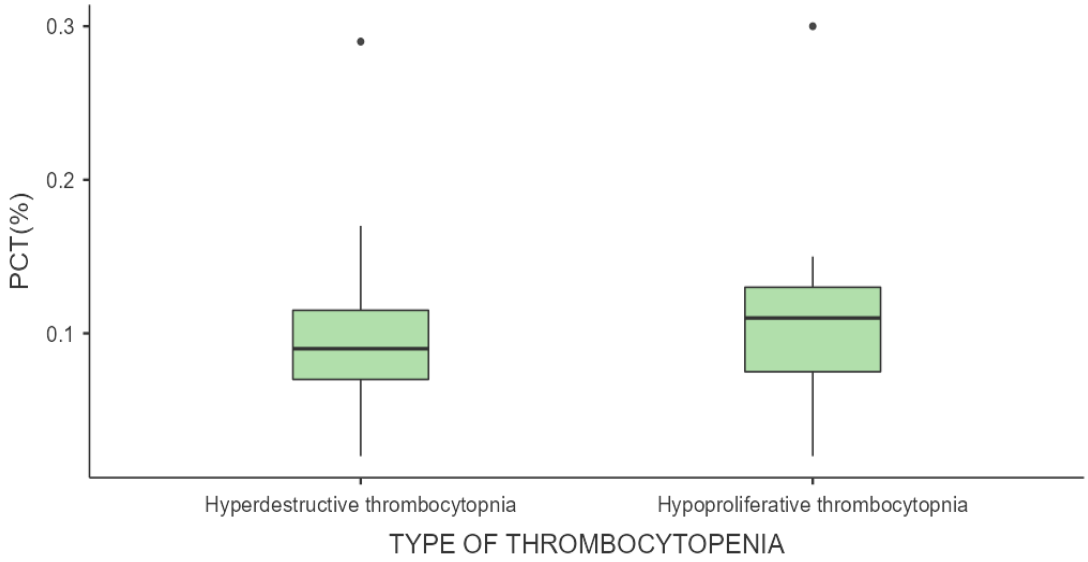
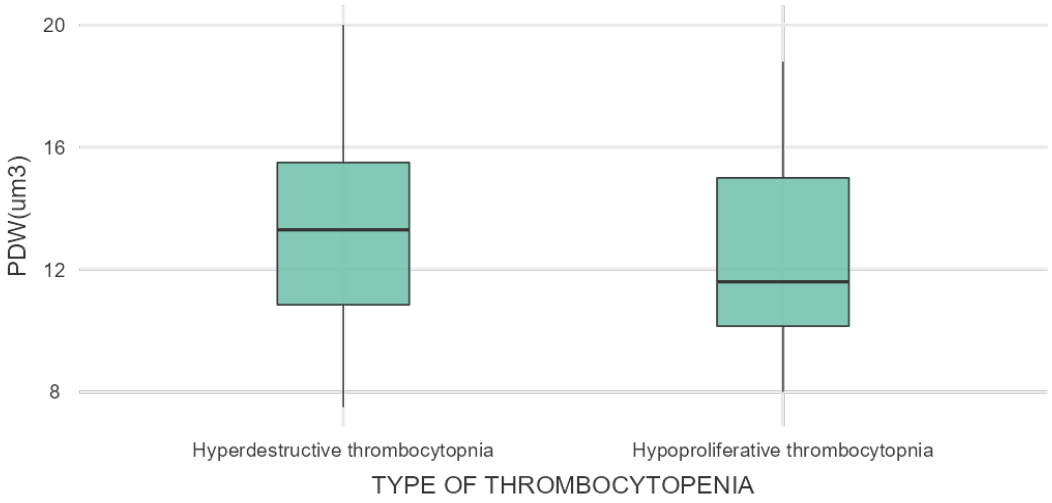


Figure 4:

Figure 5:



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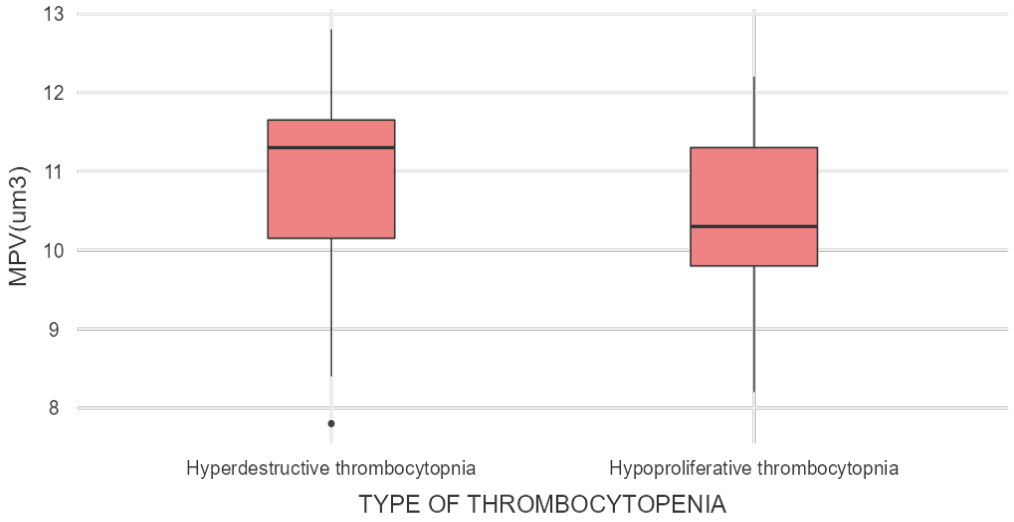

Figure 7:

Table 4: Median Platelet Indices Across Various Clinical Diagnoses

	CLINICAL DIAGNOSIS	N	Median
PLATELET COUNT (lakhs /cumm)	CLL	2	99000
	CML	2	127500
	Dengue	6	86000
	Palliativechemotherapy	20	112000
	Pancytopenia	6	88500
	SEPSIS	6	95000
	Severe Anemia	2	80000
	Fever	13	110000
	IDA	1	61000
	ITP	1	79000
	Febrile Thrombocytopenia	1	21000
	PTB	1	90000
	AML	1	14000
PCT (%)	CLL	2	0.075
	CML	2	0.11
	Dengue	6	0.085
	Palliative/Chemotherapy	20	0.12
	Pancytopenia	6	0.08
	Sepsis	6	0.09
	Severe Anemia	2	0.08
	Fever	13	0.11
	IDA	1	0.08
	ITP	1	0.09
	Febrile Thrombocytopenia	1	0.02
	PTB	1	0.1
	AML	1	0.02
P-LCR(%)	CLL	2	24.5
	CML	2	19.2
	Dengue	6	34.8
	Palliative/Chemotherapy	20	27.9
	Pancytopenia	6	25.5
	Sepsis	6	27.95
	Severe Anemia	2	35.55
	Fever	13	35.5
	IDA	1	41.6
	ITP	1	38
	Febrile Thrombocytopenia	1	37.6
	PTB	1	38.2
	AML	1	37.7
PDW(fL)	CLL	2	11.05
	CML	2	10
	Dengue	6	15.05
	Palliative/Chemotherapy	20	11.85
	Pancytopenia	6	12.45
	Sepsis	6	11.95
	Severe Anemia	2	13.7
	Fever	13	12
	IDA	1	15
	ITP	1	13.3
	Febrile Thrombocytopenia	1	16.4
	PTB	1	13.6
	AML	1	15.9
MPV(fL)	CLL	2	10.4
	CML	2	9.25
	Dengue	6	11.2
	Palliative/Chemotherapy	20	10.95

	Pancytopenia	6	9.95
	Sepsis	6	10.2
	Severe Anemia	2	11.15
	Fever	13	11.4
	IDA	1	12.4
	ITP	1	11.9
	Febrile Thrombocytopenia	1	11
	PTB	1	11.7
	AML	1	11.1

Discussion

Thrombocytopenia, defined by low platelet counts, may be caused by either decreased platelet production (hypoproliferative) or accelerated destruction (hyperdestructive) of platelets. Proper differentiation between these etiologies is important for immediate and proper clinical management.

Our study had 62 cases, with a predominant number of hyper destructive thrombocytopenia (50%) over hypo proliferative cases (50%). This is in keeping with the prevalent clinical occurrence of hyper-destructive etiologies like infections (e.g., dengue, sepsis), nonspecific fever, and inflammation in our population. Hypo proliferative cases, on the other hand, were mostly linked to malignancies, chemotherapy, and bone marrow suppression.

Of the platelet indices examined—platelet count, PCT, P-LCR, PDW, and MPV, statistical differences were observed in P-LCR and MPV, making them more diagnostic critical.

P-LCR and MPV as Discriminator: Both MPV and P-LCR levels were significantly increased in hyper destructive thrombocytopenia compared to hypo proliferative disorders ($p = 0.04$ and $p = 0.03$). This is congruent with research of Saran et al, who reported MPV and PDW elevated in hyper destructive thrombocytopenia than hypo proliferative disorders. The authors explained that increased MPV is an indicator of release of larger, more immature platelets from the bone marrow due to peripheral destruction, which is not seen in bone marrow failure disorders.

Similarly, Francis et al highlighted the diagnostic utility of MPV for immune thrombocytopenic purpura (ITP), a model of hyper destructive thrombocytopenia. They found significantly higher MPV in ITP than other etiologies and suggested that MPV could be a useful differentiating marker. PDW and P-LCR increased in hyper destructive disorders but only MPV was group significant. [7]

In leukemia-associated thrombocytopenia, Al Khafaji et al found that MPV and P-LCR were dramatically elevated in acute leukemia patients versus controls, with a negative correlation between the platelet number and these indices. [8] Our own results also indicated a tendency toward raised platelet indices in hyper destructive processes potentially involving leukemic and chemotherapy-induced disorders.

In infectious disease, Bayleyegn et al reviewed function of platelet indices in malaria. Their results identified increased MPV and PDW, alongside decreased platelet count and plateletcrit (PCT), as typical results of severe infection with malaria. [9] Our patient group with viral infections such as dengue also demonstrates this profile of platelet activation and size variability, with highly significant increases in MPV and P-LCR.

Shah et al also extended the use of platelet indices by outlining their use in viral infections in general. They explained that viral-induced thrombocytopenia tends to occur generally due to increased platelet destruction by immune mechanisms and direct viral action on platelets and megakaryocytes. [10] This is consistent with our observation of increased MPV and P-LCR in sepsis, dengue, and viral hepatitis patients.

Interestingly, PCT did not significantly differ in groups in our study, as also identified by Francis et al, who proceeded to identify that PCT might be insensitive to certain thrombocytopenic disorders. [7] Collectively, the agreement of our findings with those of a number of recent investigations confirms the clinical utility of platelet indices, P-LCR & MPV, in initial thrombocytopenia diagnosis. These can prove extremely valuable in illuminating the mechanism involved peripheral destruction or inhibition of the bone marrow, so informing further investigation and management. However, some limitations must be noted. The limited number of hypo proliferative cases in our series may have reduced statistical power for certain comparisons. Future studies will require to establish standardized cutoff values for clinical use.

Other Platelet Parameters: Although PCT and PDW were elevated in hyperdestructive thrombocytopenia, differences did not prove to be statistically significant in this study. This is possibly a consequence of the small number of hypoproliferative cases, leading to potential sample size bias. Platelet count did not vary between the groups ($p = 0.468$), showing that platelet number

alone is not essential in differentiating causes of thrombocytopenia.

Conclusion

In this research, it is established that among various platelet indices examined, MPV and P-LCR are significantly elevated in hyper destructive thrombocytopenia than hypo proliferative thrombocytopenia. Such outcomes propose that MPV & P-LCR can serve as suitable, easily available, and low-cost markers to assist in discrimination of causes of thrombocytopenia in the initial step.

While platelet count by itself is not sufficient to distinguish between production and destruction disorders, addition of MPV and P-LCR to routine hematological evaluation can enhance the diagnostic yield and facilitate early clinical decision-making.

However, due to the limited number of hypoproliferative cases in our study, large-scale studies are recommended to verify these findings and obtain standard cut-off values for clinical application in different clinical settings

References

1. Shetageri SN, Francis R, SR RP. A study to determine utility of platelet indices in differentiating hyperdestructive and hypoproductive thrombocytopenia. Journal of Pathology of Nepal. 2024 15;14
2. Senthil Nathan S, Varadaraj P, Nallusamy G, Reddy KSS. The Significance of Platelet Indices in the Evaluation of Thrombocyt openia. Cureus. 2024 30;16
3. Islam MA, Islam MA, Monni AF, Rahman MS, Khatun H, Hasan MA. Platelet Indices to Identify Hypo Productive and Hyper Destructive Thrombocytopenia. Sch J App Med Sci. 2024 ;810-6.
4. Sudjadi A, Lismayanti L, Indrati AR. Differences Platelet Indices In Hypoproliferative and Hyperdestructive Thrombocytopenia. 2022 4;114(1).
5. Vaddatti T, Inuganti Rv, Burela M. Role of Platelet Indices as a Predictive Tool in Hypoproliferative and Hyperdestructive Type of Thrombocytopenia. Journal of Clinical & Diagnostic Research. 2020 1;14(3).
6. Saran K, Vidya K, Seema K, Prasad A, Prakash J. Study of platelet indices and their role in evaluation of thrombocytopenia. J .Family Med. Prim. Care. 2022 1;11(10).
7. Francis R, Shetageri SN, Roopa AN, Parthiban SR. A study to evaluate use of platelet indices in hyperdestructive thrombocytopenia: A two-year experience from tertiary care rural hospital. Journal of Medical Sciences and Health. 2021;7(1):73-80.
8. Al Khafaji RS, Sharba IR, Mohamed AA. Platelet indices as a predict markers of thrombocytopenia associated with acute lymphoblastic leukemia and acute myeloid leukemia. 2022: 353-361
9. Bayleyegn B, Asrie F, Yalew A, Woldu B. Role of platelet indices as a potential marker for malaria severity. J. Parasitol. Res.2021 (1):5531091.
10. Shah D, Talwar D, and Kumar S, Acharya S. Platelet indices: Is it a reliable biomarker in viral infections. J Datta Meghe Inst. Med. Sci Univ. 2023; 18(2):322-6.