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Role of Platelet Indices in Differentiating Immune Thrombocytopenic Purpura (ITP) and Aplastic Anemia

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Abstract

Background: Thrombocytopenia in children may result from increased platelet destruction or decreased platelet production. Differentiating hyper destructive thrombocytopenia, such as Immune Thrombocytopenic Purpura (ITP), from hypo productive conditions like Aplastic anaemia is essential for appropriate management. Platelet indices obtained from routine automated blood counts may provide useful information regarding platelet production and destruction.

Objectives: To evaluate the role of platelet indices (Mean Platelet Volume, Platelet Distribution Width, and Plateletcrit) in differentiating ITP from Aplastic anaemia in children.

Methods: A hospital-based prospective observational study was conducted at Indira Gandhi Institute of Child Health, Bengaluru, over 18 months from January 2021 to June 2022. The study included 80 children aged 6 months to 18 years, comprising 40 children with ITP (hyper destructive group) and 40 children with aplastic anaemia (hypo productive group). Detailed clinical evaluation, complete hemogram, platelet indices (MPV, PDW, and PCT), peripheral smear examination, and bone marrow evaluation whenever indicated were performed. Platelet indices were compared between both groups.

Results: Among ITP children, the most common age group was 1–5 years (55%), whereas Aplastic anaemia was more common in the 11–18 years age group (48%). Petechiae and Purpura were the predominant presentation in ITP (87.5%), while progressive pallor was the most common symptom in Aplastic anaemia (80%).The mean MPV was significantly higher in ITP compared with Aplastic anaemia (13.0 vs 5.4 fL, $p < 0.001$). PDW was also significantly increased in ITP (17.93 ± 1.08) compared with Aplastic anaemia (9.07 ± 0.82, $p<0.001$). Plateletcrit was significantly higher in

ITP (0.50 ± 0.07%) compared with Aplastic anaemia (0.03 ± 0.02%, p<0.001).

Conclusion: Platelet indices, including MPV, PDW, and Plateletcrit, are useful parameters for differentiating hyper destructive thrombocytopenia (ITP) from hypo productive thrombocytopenia (Aplastic anaemia). These simple and cost-effective indices may aid clinical decision-making and reduce the need for invasive bone marrow examination in selected children with thrombocytopenia.

Keywords: Immune Thrombocytopenic Purpura, Aplastic Anaemia, Platelet Indices, Mean Platelet Volume, Platelet Distribution Width, Plateletcrit, Thrombocytopenia.

Introduction

Thrombocytopenia is one of the most common haematological abnormalities encountered in paediatric practice. It may result from decreased platelet production, increased platelet destruction, or increased platelet consumption. Differentiating between these mechanisms is essential for appropriate diagnosis and management. Immune Thrombocytopenic Purpura (ITP) represents a hyper destructive thrombocytopenic disorder, in which peripheral immune - mediated destruction of platelets is accompanied by compensatory increased platelet production in the bone marrow. In contrast, Aplastic anaemia is a hypo productive disorder characterized by bone marrow failure leading to decreased production of all hematopoietic cell lines, resulting in pancytopenia.[1,2]

The diagnosis of ITP is mainly clinical and based on exclusion of other causes of thrombocytopenia. Bone marrow examination is not routinely required in typical cases of childhood ITP; however, it is often performed when the diagnosis is uncertain or when other haematological abnormalities are present. In Aplastic anaemia, bone marrow aspiration and biopsy remain essential diagnostic investigations to demonstrate hypo cellular marrow with reduced hematopoietic elements.[3]

Bone marrow examination is an invasive procedure, associated with discomfort, cost, and resource utilization. Therefore, there is a need for simple, rapid, and non-invasive parameters that can help differentiate hyper destructive thrombocytopenia from hypo productive thrombocytopenia, especially in children. Automated haematology analysers provide various platelet indices as part of routine complete blood count analysis, including Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), and Plateletcrit (PCT). These parameters provide information regarding platelet size, variation in platelet volume, and total platelet mass.[4]

Mean Platelet Volume reflects the average size of circulating platelets. During increased peripheral platelet destruction, as seen in ITP, the bone marrow responds by releasing younger and larger platelets into circulation, resulting in increased MPV. In contrast, disorders with impaired platelet production, such as Aplastic anemia, show reduced platelet size and lower MPV values.[5]

Platelet Distribution Width indicates the heterogeneity of platelet size. Increased PDW suggests variation in platelet size due to increased production of young platelets, whereas decreased PDW may be observed in bone marrow failure states. Plateletcrit represents the total platelet mass in circulation and is influenced by both platelet count and platelet volume.[6]

Although platelet indices are readily available from automated blood cell counters, their clinical utility in differentiating various causes of thrombocytopenia is not fully established. Previous studies have demonstrated the

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usefulness of platelet indices in distinguishing hyper destructive thrombocytopenia from hypo productive thrombocytopenia. Nelson Hernando Aponte-Barrios et al. reported significant differences in MPV and PDW between hyper destructive and hypo productive thrombocytopenia groups. Similar findings were reported by Pooja Agarwal et al. and other investigators. [7,8]

Hence, the present study was undertaken to evaluate the role of platelet indices (MPV, PDW, and Plateletcrit) in differentiating Immune Thrombocytopenic Purpura and Aplastic anaemia in children and to assess their usefulness as simple, cost-effective, and minimally invasive diagnostic parameters.

Materials and Methods

Study Design and Setting

This was a hospital-based prospective observational study conducted at the Indira Gandhi Institute of Child Health, Bengaluru. The study was carried out over a period of 18 months, from January 2021 to June 2022.

Study Population

The study included children aged 6 months to 18 years who were newly diagnosed clinically with Immune Thrombocytopenic Purpura (ITP) or Aplastic Anaemia and admitted to the Department of Pediatrics, Indira Gandhi Institute of Child Health, Bengaluru.

Sample Size

The sample size was calculated based on the previous study by Nelson Hernando Aponte-Barrios et al., in which the area under the curve (AUC) for platelet distribution width was considered. With a 95% confidence interval (α = 5%) and an absolute precision of 10%, the required sample size was calculated as 27 subjects in each group.

The sample size was calculated using the formula:

- **n =** $[(Z\alpha/2)^2 \times V(AUC)] / d^2$
- Where,
- n = sample size per group
- $Z\alpha/2$ = critical value of the normal distribution at α = 0.05 (1.96)
- V(AUC) = Variance of AUC
- d = Absolute precision (10%)

Using the above formula:

- **n =** $(1.96)^2 \times 0.07 / (0.1)^2 = 27$

Considering feasibility and study requirements, a total of 80 children were included in the study, comprising 40 children with ITP and 40 children with Aplastic anaemia.

Inclusion Criteria

Children fulfilling the following criteria were included:

- All newly diagnosed cases of ITP and aplastic anaemia.
- Age group between 6 months and 18 years.

Exclusion Criteria

Patients with any of the following conditions were excluded:

1. Children below 6 months of age.
2. Patients who had received medications affecting platelet production or function, such as aspirin, chemotherapy, quinine, or corticosteroids.
3. Children with chronic ITP.
4. Patients with congenital platelet disorders.
5. Patients with acquired Aplastic anaemia.

Methodology

After obtaining approval from the Institutional Ethics Committee and written informed consent from the parents or guardians, eligible children were enrolled in the study.

A detailed history and complete clinical examination were performed for all enrolled children. The clinical

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findings and relevant details were recorded in a pre-designed proforma.

All participants underwent investigations including:

- Complete hemogram.
- Platelet indices including Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), and Plateletcrit (PCT).
- Peripheral blood smear examination.
- Evaluation for Aplastic anaemia.

Bone marrow aspiration and biopsy were performed in all clinically diagnosed or suspected cases of Aplastic anaemia and in selected cases of ITP whenever indicated. The platelet indices were analysed and compared between children with ITP and Aplastic anaemia.

Statistical Analysis

Data analysis was performed using appropriate statistical methods. Proportions were compared using the Chi-square test, while comparison of mean values between groups was performed using the Student's t-test. A p-value of <0.05 was considered statistically significant.

Results and Observations

A total of 80 children were included in the study over a period of 18 months (January 2021 to June 2022). Out of these, 40 children had Immune Thrombocytopenic Purpura (ITP), representing the hyper destructive group, and 40 children had Aplastic anaemia, representing the hypo productive group. The results are summarised as follows.

Table 1: Age and Sex Distribution of Study Population

Variables	ITP (n=40)	Aplastic anaemia (n=40)
Age group	No. (%)	No. (%)
1–5 years	22 (55%)	8 (20%)
6–10 years	7 (18%)	13 (33%)
11–18 years	11 (28%)	19 (48%)
Sex		
Male	17 (43%)	28 (70%)
Female	23 (57%)	12 (30%)
Male: Female ratio	1:1.3	1:0.4

In ITP, the commonest age group was 1–5 years (55%), whereas Aplastic anemia was more common in the 11–18 years age group (48%). Female predominance was observed in ITP, while males predominated in Aplastic anemia.

Table 2: Clinical Symptoms in Study Population

Symptoms	ITP (n=40) No. (%)	Aplastic anemia (n=40) No. (%)
Petechiae and purpura	35 (87.5%)	—
Progressive pallor	—	32 (80%)
Fever	—	26 (65%)
Ecchymosis	22 (55%)	5 (12.5%)
Nasal bleeding (Epistaxis)	10 (25%)	9 (23%)
Gum bleeding	6 (15%)	5 (12%)
Hematuria	—	1 (2%)
Excessive bleeding per vagina	—	1 (2%)

The most common symptom in ITP was Petechiae and Purpura (87.5%), whereas progressive pallor (80%) was the predominant symptom in Aplastic anemia.

Table 3: Clinical Signs in Study Population

Signs	ITP (n=40) No. (%)	Aplastic anaemia (n=40) No. (%)
Petechiae and purpura	35 (87.5%)	—
Pallor	3 (7.5%)	38 (95%)
Fever	—	26 (56%)

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Active mucosal bleeding	9 (22.5%)	10 (25%)
Ecchymosis	22 (55%)	5 (12.5%)

Pallor was the most common sign in Aplastic anaemia (95%), while Petechiae and Purpura were predominant in ITP (87.5%).

Table 4: Hematological Parameters in ITP Children

Parameter	No. (%)
Hemoglobin	
No anemia	23 (57.5%)
Anemia	17 (42.5%)
Total leukocyte count	
Normal (4000–11000/mm³)	27 (67.5%)
Increased (>11000/mm³)	13 (32.5%)
Platelet count	
<20,000/mm³	27 (67.5%)
20,000–50,000/mm³	12 (30%)
>50,000/mm³	1 (2.5%)

The majority of ITP children had a platelet count less than 20,000/mm³ (67.5%).

Table 5: Haematological Parameters in Aplastic Anaemia Children

Parameter	No. (%)
Hemoglobin level	
Severe anemia (<7 g/dl)	30 (75%)
Moderate anaemia (7–10 g/dl)	9 (22.5%)
Mild anemia (>10–13 g/dl)	1 (2.5%)
Total leukocyte count	
Decreased (<4000/mm³)	36 (90%)
Normal (4000–11000/mm³)	4 (10%)
Neutropenia	
Present	39 (97.5%)
Absent	1 (2.5%)
Platelet count	
<20,000/mm³	37 (92.5%)
20,000–50,000/mm³	3 (7.5%)
>50,000/mm³	0

Table 6: Peripheral Smear Findings

Findings	ITP (n=40)	Aplastic anaemia (n=40)
RBC morphology	52.5% no anaemia; 47.5% normocytic normochromic anaemia	Normocytic normochromic anaemia in all cases
WBC findings	Normal in 95%; leukocytosis in 5%	Leucopenia present in all cases
Platelet findings	Thrombocytopenia with giant platelets in 42.5%; without giant platelets in 57.5%	Thrombocytopenia present in all cases

Table 7: Bone Marrow Findings in Study Population

Bone marrow parameter	ITP (n=18)*	Aplastic anemia (n=40)
Erythroid series		
Normoblastic maturation	12 (67%)	40 (100%)
Micronormoblastic maturation	4 (23%)	—
Myeloid series		
Normal	17 (95%)	—
Decreased	1 (5%)	40 (100%)
Megakaryocytes		
Increased	18 (100%)	—
Decreased	—	40 (100%)

*Bone marrow aspiration was performed in 18 selected ITP cases.

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Table 8: Comparison of MPV Between ITP and Aplastic Anaemia

Group	No. of cases	MPV (fL) Median (IQR)	P value
ITP	40	13.00 (12.25–14.65)	
Aplastic anemia	40	5.40 (4.8–5.9)	<0.001

MPV was significantly higher in ITP compared with Aplastic anaemia.

Table 9: Comparison of PDW and Plateletcrit Between ITP and Aplastic Anaemia

Platelet index	ITP (n=40)	Aplastic anaemia (n=40)	P value
PDW	17.93 ± 1.08	9.07 ± 0.82	<0.001
Plateletcrit (%)	0.50 ± 0.07	0.03 ± 0.02	<0.001

PDW and plateletcrit were significantly increased in ITP and decreased in Aplastic anaemia.

Table 10: Comparison of Platelet Indices Between Hyper destructive and Hypo productive Groups

Platelet indices	ITP (Hyper destructive group)	Aplastic anaemia (Hypo productive group)	P value
MPV (fL)	13	5.4	<0.001
PDW	17.93	9.07	<0.001
Plateletcrit (%)	0.50	0.03	<0.001

In the present study, platelet indices (MPV, PDW, and plateletcrit) were significantly increased in ITP children and decreased in aplastic anaemia children ($p<0.001$), suggesting their usefulness in differentiating hyper destructive and hypo productive thrombocytopenia.

Discussion

Thrombocytopenia in children can occur due to increased platelet destruction or decreased platelet production. Differentiating these two mechanisms is clinically important because the management strategies differ significantly. The present study evaluated the role of platelet indices in distinguishing ITP, a hyper destructive thrombocytopenic disorder, from Aplastic anaemia, a hypo productive bone marrow failure disorder. In the present study, 80 children were included, with 40 children diagnosed with ITP and 40 children diagnosed with Aplastic anaemia. Platelet indices including MPV, PDW, and Plateletcrit were compared between both groups.

Age and Sex Distribution

In the present study, the commonest age group affected in ITP was 1–5 years (55%), whereas aplastic anemia was more common in the adolescent age group of 11–18 years (48%). Female predominance was observed in ITP with a male-to-female ratio of 1:1.3, while Aplastic anemia showed male predominance with a male-to-female ratio of 1:0.4.

The younger age predominance in ITP observed in the present study is consistent with the known epidemiology of childhood ITP, which commonly occurs in preschool children and is frequently preceded by viral infections. Aplastic anaemia, however, may occur more commonly in older children and adolescents, as observed in the present study.

Clinical Presentation

In the present study, Petechiae and Purpura were the most common presenting symptoms among ITP children (87.5%), followed by ecchymosis (55%), nasal bleeding (25%), and gum bleeding (15%). These findings reflect

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the clinical presentation of thrombocytopenia due to peripheral platelet destruction.

Among children with Aplastic anaemia, progressive pallor was the most common symptom (80%), followed by fever (65%), nasal bleeding (23%), ecchymosis (12.5%), and gum bleeding (12%). The clinical features were consistent with bone marrow failure resulting in anaemia, neutropenia, and thrombocytopenia.

Hematological Findings

In ITP children, anaemia was absent in the majority of cases (57.5%), while 42.5% had anaemia. Total leukocyte count was normal in 67.5% of cases. Most children with ITP had severe thrombocytopenia with platelet counts less than 20,000/mm³ (67.5%).

In Aplastic anaemia, severe anaemia was observed in 75% of children. Leukopenia was present in 90% of cases and neutropenia was seen in 97.5% of children. Severe thrombocytopenia with platelet count less than 20,000/mm³ was observed in 92.5% of cases.

These findings highlight the difference between the two conditions, where ITP mainly affects platelets, whereas Aplastic anemia involves multiple hematopoietic cell lines.

Peripheral Smear and Bone Marrow Findings

Peripheral smear examination in ITP showed thrombocytopenia with giant platelets in 42.5% of children, suggesting increased peripheral destruction and compensatory marrow response. In Aplastic anemia, pancytopenia with normocytic normochromic anemia, Leukopenia, and thrombocytopenia was observed.

Bone marrow examination in selected ITP cases showed increased megakaryocytes in all cases, supporting peripheral platelet destruction. In Aplastic anemia, all cases showed hypo cellular marrow with decreased myeloid series and megakaryocytes, confirming defective platelet production.

Platelet Indices

Mean Platelet Volume (MPV)

The present study demonstrated a significant difference in MPV between ITP and Aplastic anemia. The mean MPV was 13 fL in ITP children, whereas it was 5.4 fL in Aplastic anemia children ($p<0.001$).

In ITP, peripheral platelet destruction stimulates bone marrow compensation, resulting in release of immature, larger platelets into circulation, thereby increasing MPV. In Aplastic anemia, impaired megakaryocyte production results in decreased release of platelets and lower MPV.

Similar findings were reported by Nelson Hernando Aponte-Barrios et al., who observed higher MPV values in hyper destructive thrombocytopenia compared with hypo productive thrombocytopenia. Pooja Agarwal et al. also demonstrated significantly increased MPV in ITP compared with Aplastic anemia.[7,8]

Platelet Distribution Width (PDW)

In the present study, PDW was significantly higher in ITP (17.93 ± 1.08) compared with Aplastic anemia (9.07 ± 0.82) ($p<0.001$).

Increased PDW in ITP reflects increased variation in platelet size due to release of young, larger platelets from the bone marrow. Reduced PDW in Aplastic anemia indicates uniform reduction in platelet production.

The findings are comparable with previous studies by Nelson Hernando Aponte-Barrios et al. and Pooja Agarwal et al., who also reported significantly higher PDW values in hyper destructive thrombocytopenia.[7,8]

Plateletcrit (PCT)

Plateletcrit represents the total circulating platelet mass. In the present study, plateletcrit was significantly higher

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in ITP children (0.50 ± 0.07%) compared with Aplastic anemia children (0.03 ± 0.02%) ($p<0.001$).

The increased plateletcrit in ITP is due to increased production of larger platelets despite reduced platelet count, whereas decreased plateletcrit in Aplastic anemia reflects reduced platelet production by the bone marrow.

Similar observations were reported by Baig et al., who demonstrated differences in plateletcrit between hyper destructive and hypo productive thrombocytopenia groups.[9]

Conclusion

Platelet indices (MPV, PDW, and Plateletcrit) are simple, readily available, and cost-effective parameters that can help differentiate hyper destructive thrombocytopenia (ITP) from hypo productive thrombocytopenia (Aplastic anemia). In the present study, all three platelet indices were significantly higher in ITP and lower in Aplastic anemia ($p<0.001$). These indices may serve as useful adjuncts in the evaluation of thrombocytopenic children and may help reduce unnecessary invasive bone marrow examinations in selected cases of ITP.

References

1. Provan D, Stasi R, Newland AC, et al. International consensus report on the investigation and management of primary immune thrombocytopenia. Blood. 2010; 115 (2):168-186.

2. Young NS. Aplastic anemia. N Engl J Med. 2018; 379:1643-1656.

3. Neunert C, Terrell DR, Arnold DM, et al. American Society of Hematology guidelines for immune thrombocytopenia. Blood Adv. 2019; 3 (23):3829-3866.

4. Briggs C, Kunka S, Hart D, Oguni S, Machin SJ. Assessment of an immature platelet fraction (IPF) in peripheral thrombocytopenia. Br J Haematol. 2004; 126: 93-99.

5. Bath PM, Butterworth RJ. Platelet size: measurement, physiology and vascular disease. Blood Coagul Fibrinolysis. 1996; 7:157-161.

6. Budak YU, Polat M, Huysal K. The use of platelet indices, plateletcrit, mean platelet volume and platelet distribution width in emergency patients. J Clin Lab Anal. 2016; 30:67-72.

7. Aponte-Barrios NH, et al. Platelet indices in differentiation of hyper destructive and hypo productive thrombocytopenia.

8. Agarwal P, et al. Role of platelet indices in differentiating immune thrombocytopenia from Aplastic anemia and other causes of thrombocytopenia.

9. Baig MA, et al. Evaluation of platelet indices in various thrombocytopenic disorders.

10. Poonam S, et al. Role of platelet indices in differentiating thrombocytopenic disorders

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