



Original Article

## Alterations in Platelet Count and Platelet Indices in Relation with Disease Severity of Malaria: A Retrospective Study from Western India

Dipali Mandalia<sup>1</sup>, Dr. Trupti Purohit<sup>2</sup>, Dr. Bhoomika Dadhania<sup>3</sup>, Dr. Deepa Jethwani<sup>4</sup>, Dr. Gauravi Dhruva<sup>5</sup>

<sup>1</sup>2nd Year Resident, Department of Pathology, PDUMC, Rajkot, IND,

<sup>2,3</sup>Assistant Professor, Department of Pathology, PDUMC, Rajkot, IND

<sup>4</sup>Associate Professor, Department of Pathology, PDUMC, Rajkot, IND

<sup>5</sup>Professor & Head of the Department, Department of Pathology, PDUMC, Rajkot, IND

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### Corresponding Author:

Dr. Dipali Mandaliya

2nd Year Resident, Department of Pathology, PDUMC, Rajkot, IND,

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### ABSTRACT

**Background:** Malaria remains a major public health challenge in endemic regions, including India, and is frequently associated with hematological abnormalities.

Thrombocytopenia is a well-recognized feature of malaria, yet alterations in platelet indices may provide additional insight into disease pathophysiology. This study aimed to evaluate platelet count and platelet indices—Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), and Plateletcrit (PCT)—in patients with malaria and to compare these parameters across different *Plasmodium* species.

**Methods:** A retrospective observational study was conducted at a tertiary care hospital in Western India from January 2025 to December 2025. Laboratory data from 100 microscopically confirmed malaria cases were analyzed using an automated hematology analyzer. Platelet count and indices were recorded and compared among *Plasmodium vivax* (n=66), *Plasmodium falciparum* (n=30), and mixed infections (n=4). Adult and pediatric cases were included.

**Results:** Malaria infection was associated with significant thrombocytopenia and a marked reduction in plateletcrit (mean  $0.072 \pm 0.05$ ). Mean Platelet Volume was elevated, indicating increased peripheral platelet destruction with compensatory bone marrow response. These alterations were observed across all species groups, suggesting shared mechanisms affecting platelet kinetics and morphology.

**Conclusion:** Malaria is characterized by significant quantitative and morphological platelet changes. Automated platelet indices may serve as accessible adjunctive biomarkers in the diagnostic evaluation and clinical monitoring of malaria.

Prospective studies are required to determine their prognostic significance and correlation with disease severity.

**Keywords:** Malaria, Thrombocytopenia, Platelet Indices, Mean Platelet Volume, Plateletcrit.

### INTRODUCTION

Malaria is a life-threatening parasitic disease caused by *Plasmodium* species and transmitted through the bite of female *Anopheles* mosquitoes. Among the species, *Plasmodium vivax* predominates in Asia, whereas *Plasmodium falciparum* is more common in Africa. Severe malaria continues to be a major cause of morbidity and mortality worldwide. While *P. falciparum* is often associated with fatal outcomes, *P. vivax* can also result in life-threatening complications. Vulnerable populations include children under five, pregnant women, and elderly individuals, whose immune systems render them more susceptible to rapid disease progression and complications such as severe anemia.

Hematological disturbances are common complications of malaria and play a key role in clinical severity. Thrombocytopenia, defined as a platelet count below  $150 \times 10^3/\mu\text{L}$ , is frequently observed in malaria patients. The mechanisms contributing to low platelet counts are multifactorial, including peripheral platelet destruction, splenic sequestration, bone marrow suppression, platelet consumption in disseminated intravascular coagulation, immune-

mediated destruction, oxidative stress, and abnormal interactions with parasitized red blood cells .

Beyond platelet count, alterations in platelet indices—Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Platelet Large Cell Ratio (P-LCR), and Plateletcrit (PCT)—reflect changes in platelet morphology and function .

Elevated MPV indicates increased release of young, larger platelets from the bone marrow in response to peripheral loss, whereas PDW reflects variability in platelet size due to anisocytosis. PCT, representing the total platelet mass, decreases with thrombocytopenia and reflects overall platelet availability.

Automated hematology analyzers now allow rapid measurement of these indices, which may serve as adjunctive markers for disease severity, prognosis, and early identification of high-risk malaria patients.

Assessing platelet parameters alongside standard diagnostic methods could enhance early detection, guide clinical management, and provide a better understanding of malaria pathophysiology .

## METHODS

A retrospective observational study was conducted at the Central Clinical Laboratory, PDU Hospital, Rajkot, India, to evaluate platelet counts and platelet indices in patients diagnosed with malaria. Data were collected for all laboratory-confirmed malaria cases between January 2025 and December 2025.

### Inclusion Criteria

- Patients of all ages with confirmed malaria infection by peripheral blood smear examination and/or rapid diagnostic test (RDT).
- Both *Plasmodium vivax* and *Plasmodium falciparum* infections, including mixed infections.
- Patients with complete laboratory records of platelet parameters, including platelet count, Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), and Plateletcrit (PCT).

### Exclusion Criteria

- Patients with pre-existing hematological disorders, such as idiopathic thrombocytopenic purpura or leukemia.
- Patients with concurrent infections or conditions known to affect platelet counts (e.g., dengue, HIV, hepatitis, sepsis).
- Patients on medications affecting platelet function or count (e.g., chemotherapy, antiplatelet therapy).
- Incomplete or missing laboratory data.

A total of 100 malaria-positive patients met the inclusion criteria, comprising 85 adults and 15 pediatric patients aged 0–12 years. Among them, 66% were infected with *P. vivax*, 30% with *P. falciparum*, and 4% had mixed infections, indicating predominance of *P. vivax* in the study population.

Platelet parameters were measured using an automated hematology analyzer, ensuring standardized and reproducible results. Continuous variables were expressed as mean  $\pm$  standard deviation. Plateletcrit, reflecting total platelet mass, was significantly reduced (mean  $0.072 \pm 0.05$ ), consistent with malaria-associated thrombocytopenia. All patient identifiers were anonymized to maintain confidentiality. Automated assessment of platelet indices allowed evaluation of their potential as adjunctive markers for malaria severity and disease progression.

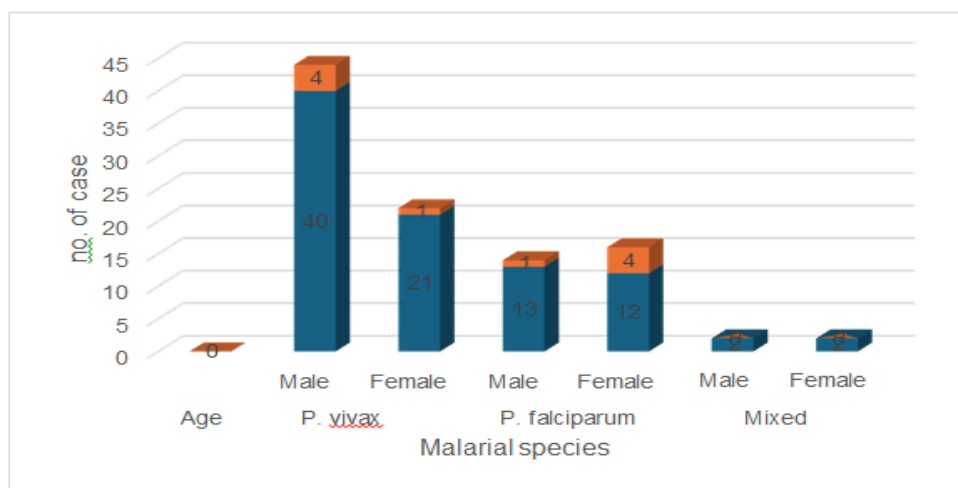
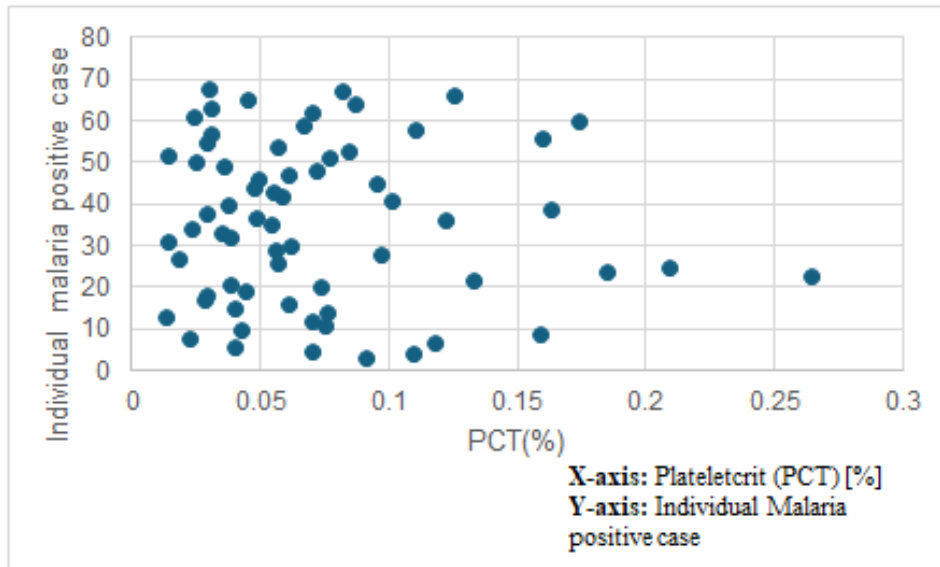


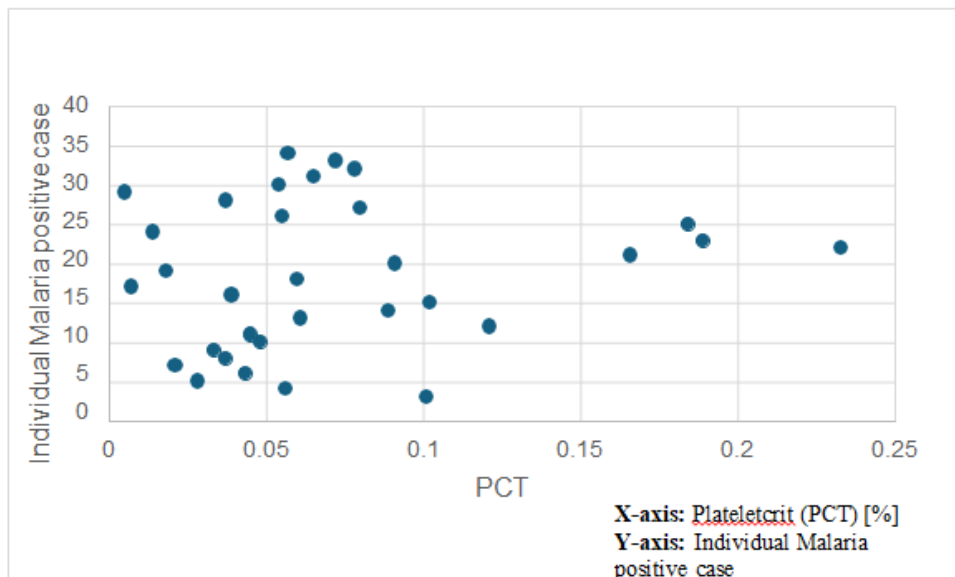
Figure 1: Age and Gender Distribution of Malaria Cases by Species:

**Table 1: Age and Gender Distribution of Malaria Cases by Species:**

Age group	P. vivax		P. falciparum		Mixed	
	Male	Female	Male	Female	Male	Female
Adult	40	21	13	12	02	02
Paediatric	04	01	01	04	00	00
Total	44	22	14	16	02	02



**Figure 2 : Marked Reduction in Plateletcrit (PCT) Among Plasmodium vivax Positive Cases:**



**Figure 3 : Reduction in Plateletcrit (PCT) Among Plasmodium falciparum Positive Cases:**

**CONCLUSION**

Platelet indices demonstrate significant potential in assessing malaria severity. An increase in Mean Platelet Volume (MPV) and Platelet Distribution Width (PDW), coupled with a decrease in Plateletcrit (PCT) and platelet count, serves as a reliable predictor of disease severity. These alterations are especially prominent in conditions characterized by increased peripheral platelet destruction, such as severe malaria, underscoring their clinical utility for early diagnosis and prognosis.

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## Conflicts of Interest:

The authors declare no conflicts of interest related to this study.

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