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Original Research Paper

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UTILITY OF PLATELET INDICES IN ASSESSING THROMBOCYTOPENIA IN CHILDREN WITH DENGUE INFECTION: A CROSS-SECTIONAL STUDY FROM A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

Background: Dengue is one of the most common mosquito-borne viral infections affecting children in tropical countries. Thrombocytopenia is a characteristic haematological manifestation of dengue infection and contributes significantly to disease monitoring and management. Platelet indices, including MPV, PDW and plateletcrit (PCT), are inexpensive parameters generated by automated haematology analysers and may provide additional information regarding platelet kinetics and the severity of thrombocytopenia.**Objectives:** To evaluate platelet indices in children with dengue infection and determine their utility in assessing thrombocytopenia and predicting severe thrombocytopenia. **Methods** A hospital-based cross-sectional study was conducted in the Department of Paediatrics, Koppal Institute of Medical Sciences, Karnataka, India. 100 children aged 1 month to 15 years with serologically confirmed dengue infection were enrolled. Platelet count, MPV, PDW, and PCT were recorded using an automated haematology analyser and Statistical analysis done. **Results:** Moderate thrombocytopenia was the most frequent finding (53%). Reduced plateletcrit was observed in 89% of cases. Platelet count demonstrated a significant positive correlation with plateletcrit ($p < 0.001$), whereas MPV showed a weak positive correlation with PDW ($p = 0.036$). Plateletcrit showed a significant association with thrombocytopenia severity ($p = 0.011$) and remained the only independent predictor of severe thrombocytopenia on multivariable logistic regression ($p = 0.026$). MPV and PDW were not independently associated with thrombocytopenia severity or ICU admission. **Conclusions:** Plateletcrit is a useful adjunctive marker for assessing thrombocytopenia severity in paediatric dengue and independently predicts severe thrombocytopenia. MPV and PDW may complement routine haematological assessment but should not be used in isolation to predict disease severity.

KEYWORDS : Dengue; Thrombocytopenia; Platelet indices; Plateletcrit; Children.

INTRODUCTION

Dengue is the fastest-growing arboviral infection worldwide and remains a major public health challenge in tropical and subtropical countries.[1–3] According to the World Health Organization, approximately half of the world's population is now at risk of dengue infection, with India contributing substantially to the global disease burden.

Automated haematology analysers routinely provide platelet indices such as mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT) as part of the complete blood count.[28–30] These parameters are inexpensive, rapidly available, and have been investigated as surrogate markers of platelet production and destruction. Previous studies have reported conflicting results regarding their clinical utility in dengue infection, particularly in the paediatric population.

Most available studies evaluating platelet indices have been conducted in adults, and paediatric data from India remain limited.[7,8,12–15] Furthermore, evidence regarding the role of platelet indices in predicting severe thrombocytopenia is scarce. The present study was therefore undertaken to evaluate platelet indices in children with dengue infection and determine their utility in assessing thrombocytopenia and predicting severe thrombocytopenia in a tertiary care hospital in South India.

OBJECTIVES

Primary Objective

To evaluate platelet indices (MPV, PDW, and plateletcrit) in children with serologically confirmed dengue infection.

Secondary Objectives

- To determine the association between platelet indices and the severity of thrombocytopenia.
- To evaluate the relationship between platelet indices and ICU admission.
- To identify independent predictors of severe thrombocytopenia using multivariable logistic regression.
- To assess the clinical utility of platelet indices in paediatric dengue.

MATERIALS AND METHODS

A hospital-based cross-sectional observational study was conducted in the Department of Paediatrics, Koppal Institute of Medical Sciences (KIMS), Koppal, Karnataka, India, from January 2023 to April 2024. The study was carried out after obtaining approval from the Institutional Ethics Committee.

Study Population

Children aged 1 month to 15 years admitted with clinically suspected and serologically confirmed dengue infection during the study period were enrolled consecutively until the required sample size was achieved.

RESULTS

Baseline Characteristics

- A total of 100 children with serologically confirmed dengue infection were included in the study.
- The mean age of the study population was 8.5 ± 3.8 years. Female children constituted 56%, while 44% were males.

Table 1. Baseline characteristics of study participants (N = 100)

AGE	VARIABLE (%)	SEX	FREQUENCY
≤ 1 yr	7	Female	56
2-5 yrs	19	Male	44
6-10 yrs	46	Total	100
11-15 yrs	28		
Total	100		

Dengue Serology

The table indicates that most children presented during the early phase of illness

Table 2. Dengue serological profile

SEROLOGY	FREQUENCY
IgM+ve	33
NS1+ve	51
NS1+ve & IgM+ve	16
Total	100

Clinical Characteristics

More children needed ward care over ICU care.

Table 3. Clinical characteristics

ICU CARE	FREQUENCY
Yes	22
No	78
Total	100

Severity of Thrombocytopenia

Table 4. Severity of thrombocytopenia

THROMBOCYTOPENIA	FREQEUNCY
<20,000	12
20,000-1,00,000	53
1,00,000-1,50,000	35

Platelet Indices

Table 5. Distribution of platelet indices

MPV	CATEGORY	FREQUENCY
<6.5	LOW	4
6.5-12	NORMAL	86
>12	HIGH	10
PDW		
<9.0	LOW	8
9.0-17.0	NORMAL	78
>17.0	HIGH	14
PCT		
<0.17	LOW	89
0.17-0.35	NORMAL	9
>0.35	HIGH	2

Correlation Between Platelet Parameters

Pearson's correlation analysis demonstrated a moderate positive correlation between platelet count and plateletcrit ($r = 0.474$, $p < 0.001$).

A weak positive correlation was observed between MPV and PDW ($r = 0.210$, $p = 0.036$).

No statistically significant correlation was found between platelet count and MPV or PDW (Table 6).

Table 6. Correlation between platelet parameters

VARIABLES	CORRELATION COEFFICIENT (R)	P VALUE
Platelet count vs MPV	—	0.132
Platelet count vs PDW	—	0.713
Platelet count vs PCT	0.474	<0.001*
MPV vs PDW	0.210	0.036*

*Statistically significant.

Association Between Platelet Indices and Severity of Thrombocytopenia

Plateletcrit demonstrated a significant association with thrombocytopenia severity ($p = 0.011$) (Table 7).

Table 7. Association of platelet indices with thrombocytopenia severity

VARIABLE	P VALUE
MPV	0.641
PDW	0.054
Plateletcrit	0.011

Platelet Indices and ICU Admission

Children admitted to the PICU had lower mean platelet counts than those admitted to the paediatric ward; however, the difference was not statistically significant.

Similarly, MPV, PDW, and plateletcrit did not differ significantly between the two groups (Table 8).

Table 8. Comparison of platelet indices according to ICU admission

VARIABLE	P VALUE
Platelet count	0.296
MPV	0.731
PDW	0.536
Plateletcrit	0.629

Multivariable Logistic Regression

A multivariable logistic regression model was constructed using severe thrombocytopenia (<20,000/μL) as the dependent variable.

After adjustment for age, sex, MPV, and PDW, plateletcrit emerged as the only independent predictor of severe thrombocytopenia ($p = 0.026$).

Table 9. Multivariable logistic regression for predictors of severe thrombocytopenia

VARIABLE	P VALUE
Age	0.205
Sex	0.245
MPV	0.103
PDW	0.939
Plateletcrit	0.026

DISCUSSION

The present hospital-based cross-sectional study evaluated the utility of platelet indices in assessing thrombocytopenia among children with laboratory-confirmed dengue infection. The study demonstrated that plateletcrit (PCT) showed the strongest association with thrombocytopenia severity and emerged as an independent predictor of severe thrombocytopenia, whereas mean platelet volume (MPV) and platelet distribution width (PDW) were not independently associated with disease severity or intensive care admission.

The majority of children in the present study belonged to the 6–10-year age group, with a slight female predominance. Similar age distributions have been reported in several Indian paediatric studies, reflecting increased exposure of school-aged children to Aedes mosquitoes. Although many previous studies have demonstrated male predominance, the female predominance observed in our study may represent regional epidemiological variation and differences in healthcare-seeking behaviour.

Moderate thrombocytopenia was the most common haematological abnormality, followed by mild and severe thrombocytopenia. This finding is comparable with previous paediatric studies, which have consistently reported moderate thrombocytopenia as the predominant presentation in hospitalized children with dengue. Thrombocytopenia in dengue results from a combination of transient bone marrow suppression, immune-mediated platelet destruction, complement activation, platelet apoptosis, and increased peripheral consumption.[20,22–24] These mechanisms may coexist and vary during different phases of the illness.

One of the important observations in the present study was that most children had MPV and PDW values within the normal reference range despite significant thrombocytopenia.[7,12–15] Furthermore, neither MPV nor PDW demonstrated a significant association with thrombocytopenia severity or independently predicted severe thrombocytopenia. Similar observations

have been reported in several recent studies, suggesting that although MPV and PDW reflect platelet morphology and activation, they are influenced by multiple biological and analytical factors, including the timing of blood sample collection, disease phase, platelet swelling in EDTA, and differences among haematology analysers. Consequently, isolated measurements of MPV or PDW may not reliably reflect the underlying mechanism or severity of thrombocytopenia in dengue.

In contrast, plateletcrit was reduced in the majority of patients and demonstrated a significant positive correlation with platelet count.[7,8,12,13] Plateletcrit also showed a significant association with thrombocytopenia severity and remained the only independent predictor of severe thrombocytopenia on multivariable logistic regression. Plateletcrit represents the total circulating platelet mass by integrating platelet count and platelet volume, making it a biologically plausible marker of overall platelet status. Recent paediatric studies have similarly reported plateletcrit as a reliable indicator of thrombocytopenia severity and disease progression in dengue, supporting the findings of the present study.

The present study did not demonstrate significant differences in platelet indices between children admitted to the paediatric intensive care unit and those managed in the general paediatric ward. This observation suggests that platelet indices alone should not be used to determine disease severity or predict the need for intensive care. Clinical assessment, warning signs, evidence of plasma leakage, hemodynamic status, haematocrit trends, and serial laboratory monitoring remain the cornerstone of management in paediatric dengue.[1,2,18,19]

The present study contributes additional evidence supporting the clinical utility of plateletcrit in paediatric dengue.[7,8,12,13] As platelet indices are routinely generated by automated haematology analysers without additional cost, plateletcrit may serve as a useful adjunct to platelet count during routine evaluation. However, platelet indices should complement, rather than replace, comprehensive clinical assessment.

Strengths Of The Study

The present study has several strengths. It included only serologically confirmed dengue cases, reducing the possibility of diagnostic misclassification. Platelet indices were obtained using standardized automated haematology analysers as part of routine clinical evaluation, making the findings readily applicable to everyday practice. In addition to descriptive analysis, the study employed correlation analysis and multivariable logistic regression to evaluate the independent predictive value of platelet indices, thereby strengthening the scientific rigor of the study.

LIMITATIONS

The present study has certain limitations. First, it was conducted at a single tertiary care centre with a relatively small sample size, which may limit the generalizability of the findings. Second, platelet indices were measured at a single time point, and serial measurements throughout the course of illness were not available. Third, immature platelet fraction, thrombopoietin levels, platelet antibody assays, and bone marrow examinations were not performed. Therefore, the exact mechanism responsible for thrombocytopenia could not be established. Finally, analyser-specific reference ranges may limit direct comparison with studies using different haematology analysers.

Future multicentre prospective studies with larger sample sizes, serial platelet index measurements, and advanced platelet biomarkers are required to validate these findings and better understand platelet kinetics during dengue infection.

CONCLUSION

Platelet indices are useful adjunctive haematological parameters in children with dengue infection. The plateletcrit being low corelates with haemodilution which happens during dengue illness.[1,2,19] MPV and PDW being within normal range point towards the fact that bone marrow hypocellularity could be the cause of thrombocytopenia. But this cannot be completely ascertained.

Among the indices evaluated, plateletcrit demonstrated the strongest association with thrombocytopenia severity and emerged as an independent predictor of severe thrombocytopenia. In contrast, MPV and PDW were not independently associated with thrombocytopenia severity or the requirement for intensive care.

These findings suggest that plateletcrit may provide additional clinical information beyond platelet count alone and can assist clinicians in the assessment of thrombocytopenia in paediatric dengue.[7,8,12,13] Nevertheless, platelet indices should always be interpreted in conjunction with clinical findings and routine laboratory investigations. Larger multicentre studies incorporating serial platelet measurements and advanced platelet biomarkers are needed before platelet indices can be routinely used as prognostic markers in paediatric dengue.

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