# CORRELATION OF MPV AND PLATELET COUNT IN DENGUE CASES AS PROGNOSTIC MARKERS


## ABSTRACT

**Background:** Dengue is rapidly emerging arboviral disease associated with considerable morbidity, mainly due to thrombocytopenia and hemorrhagic complication. Mean platelet volume (MPV) which reflects platelet production and activation, may act as a useful prognostic indicator in dengue infection.

**Aim:** To determine the relationship between MPV and platelet count in dengue patients and evaluate its prognostic vale.

**Material and methods**: This cross sectional study included 62 serologically confirmed dengue patient's admitted between June and September 2022. Complete blood count parameter was measured using an automated hematology analyzer. Statical analysis was performed using IBM SPSS version 25. Since data were non-normally distributed (Kolmogorov–Smirnov test), Spearman correlation was applied. A p-value <0.05 was considered statistically significant.

**Results:** The median platelet count was 1.87 (IQR 1.18) and median MPV was 9.64 fL (IQR 1.31). A statistically significant correlation was observed between platelet count and MPV ($r = 0.65$, $p < 0.0001$). similar significant correlations were observed across all age groups.

**Conclusion**: Regular monitoring of MPV along with platelet count may serve as a useful prognostic tool for predicting significant thrombocytopenia in dengue patients. MPV may assist in the early detection of patients who are at risk of developing complications.

**Keywords**: Dengue fever, Mean Platelet Volume, Thrombocytopenia, Platelet indices, Prognostic marker.

## Introduction

Dengue is one of the most significant mosquito-borne viral diseases worldwide. The World Health Organization considers dengue to be a significant global public health concern. It is an acute viral illness caused by four distinct serotypes of the dengue virus (DEN-1 to DEN-4), which belong to the genus *Flavivirus* of the family *Flaviviridae*. The infection is primarily spread through the bite of infected *Aedes aegypti* mosquitoes [1,2]. It is estimated that approximately 390 million dengue infections occur globally each year, of which approximately 96 million cases show clinical symptoms. The disease burden is particularly substantial in tropical and subtropical regions, including India, where recurrent outbreaks and the co-circulation of multiple serotypes have contributed to expanding geographic distribution and increasing case numbers.

The clinical presentation of dengue varies widely, varying from uncomplicated dengue fever (DF) to more severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Severe forms are associated with thrombocytopenia, plasma leakage, bleeding tendencies, and circulatory shock [3,4]. Thrombocytopenia is considered an important marker of disease severity and plays a role in hemorrhagic complications, although platelet levels do not always directly correspond to the extent of bleeding [10]. Typically, platelet counts decline between the third and seventh day of illness and tend to recover by the eighth to tenth day. The mechanisms responsible for thrombocytopenia in dengue include viral suppression of bone marrow activity, increased peripheral destruction of platelets, enhanced consumption, and abnormal sequestration [11,12]

Platelet indices particularly platelet count and mean platelet volume (MPV), have been widely investigated for their possible diagnostic and prognostic significance in cases of febrile thrombocytopenia and severe dengue [2]. Several studies have assessed platelet count as a marker for monitoring the progression and severity of the disease More recently, attention has shifted toward MPV, which reflects platelet size and activation status, as a possible predictor of recovery patterns in dengue patients [5]. While platelet count indicates the quantitative aspect of circulating platelets, MPV provides insight into platelet production dynamics and functional activity [6].

The management of dengue remains largely supportive, emphasizing symptomatic treatment with antipyretics, maintenance of adequate hydration, and close monitoring during the critical phase to prevent complications.

Although several studies highlight the potential diagnostic and prognostic importance of MPV in febrile thrombocytopenia, findings regarding its predictive value in dengue are inconsistent. In light of these varying results, the present study was designed to examine the relationship between MPV and platelet count and to determine its prognostic significance in patients with dengue infection.

**Materials and Methods**:

Dengue suspects were defined as patients who were presented with acute febrile illness associated with rash, bleeding manifestations, leukopenia, or thrombocytopenia. These patients were assessed based on the World Health Organization criteria for probable dengue infection. Blood samples were obtained from patients clinically suspected of dengue between June 2022 and August 2022 at Padmashree Diagnostic Center, Bangalore. The study was carried out from June to September 2022 in the Department of Pathology at Padmashree Diagnostic Center, Bengaluru. During the study period, a total of 62 dengue cases were included.Detailed demographic and clinical data, including age, sex, clinical diagnosis, and relevant hematological parameters, was obtained from the patients' case records.Hematological analysis was carried out using the Mindray BC-3000 Plus automated hematology analyzer. Venous blood samples were collected in K-EDTA tubes and analyzed within 30 minutes to 5 hours of collection. All cases of thrombocytopenia were further evaluated by peripheral blood smear examination. Cases showing discordance between automated analyzer results and peripheral smear findings were excluded from the study.

### Inclusion Criteria

All Patients above 18 years with serologically proven cases of Dengue with thrombocytopenia and complete hemogram data.

### Exclusion Criteria

- Evidence for Cirrhosis.
- Sepsis or other active infections.
- On antiplatelet drugs or NSAIDS.
- ITP cases.
- Patients on anticoagulant therapy.

## Results:

## Statistical Analysis

In the result section of this research article, we utilized IBM SPSS Version 25 to conduct comprehensive statistical analyses of our data. The Kolmogorov-Smirnov Test was applied to assess whether the data followed a normal distribution and the data were found to be not-normally distributed; hence non-parametric tests were used for further analysis.

To provide a clear understanding of the dataset, we employed descriptive statistics, including measures of central tendency and dispersion, which were generated. In addition, we performed inferential statistical tests including Spearman correlation analysis. The 3 age groups were categorized for further analysis; 0-20 years, 21-40 years, and 41-60 years. Spearman correlation analysis was performed to check the correlation between platelet count and MPV values. To ensure the robustness of the study findings, all statistical analyses were carried out with a Class Interval of 95% and a margin of error of 5%.

## Descriptives

| CHARACTERISTICS (n = 62) | MEDIAN (IQR) | P-value |
|---|---|---|
| **AGE (Years)** | **14.5 (20)** | |
| **MALE (n =32)** | 15.50 (19) | |
| **FEMALE (n=30)** | 12.5 (22) | |
| **Platelet Count (SU)** | **1.87 (1.18)** | |
| **Gender** | | |
| **MALE (n =32)** | 1.81 (1.07) | 0.458 |
| **FEMALE (n=30)** | 2.03 (1.15) | |
| **Age Group (Years)** | | |
| **0-20** | 2.01 (1.22) | 0.479 |
| **21-40** | 1.66 (1.00) | |

| | | |
|---|---|---|
| **41-60** | 1.60 (1.98) | |
| **MPV (SU)** | **9.64 (1.31)** | |
| **Gender** | | |
| **MALE (n =32)** | 9.60 (1.29) | 0.933 |
| **FEMALE (n=30)** | 9.67 (1.41) | |
| **Age Group (Years)** | | |
| **0-20** | 9.63 (1.32) | 0.242 |
| **21-40** | 9.45 (1.13) | |
| **41-60** | 10.1 (1.54) | |

Table 1. Descriptive Statistics

SU= Standard Unit, IQR= Interquartile Range, MVP= Mean Platelet Volume

## Inferential Statistics

| | MPV | |
|---|---|---|
| | r Value | p Value |
| Platelet Count | 0.65 | <0.0001* |

Table 2. Correlation Between Platelet Count and MPV

* Significant Value at the 0.05 level

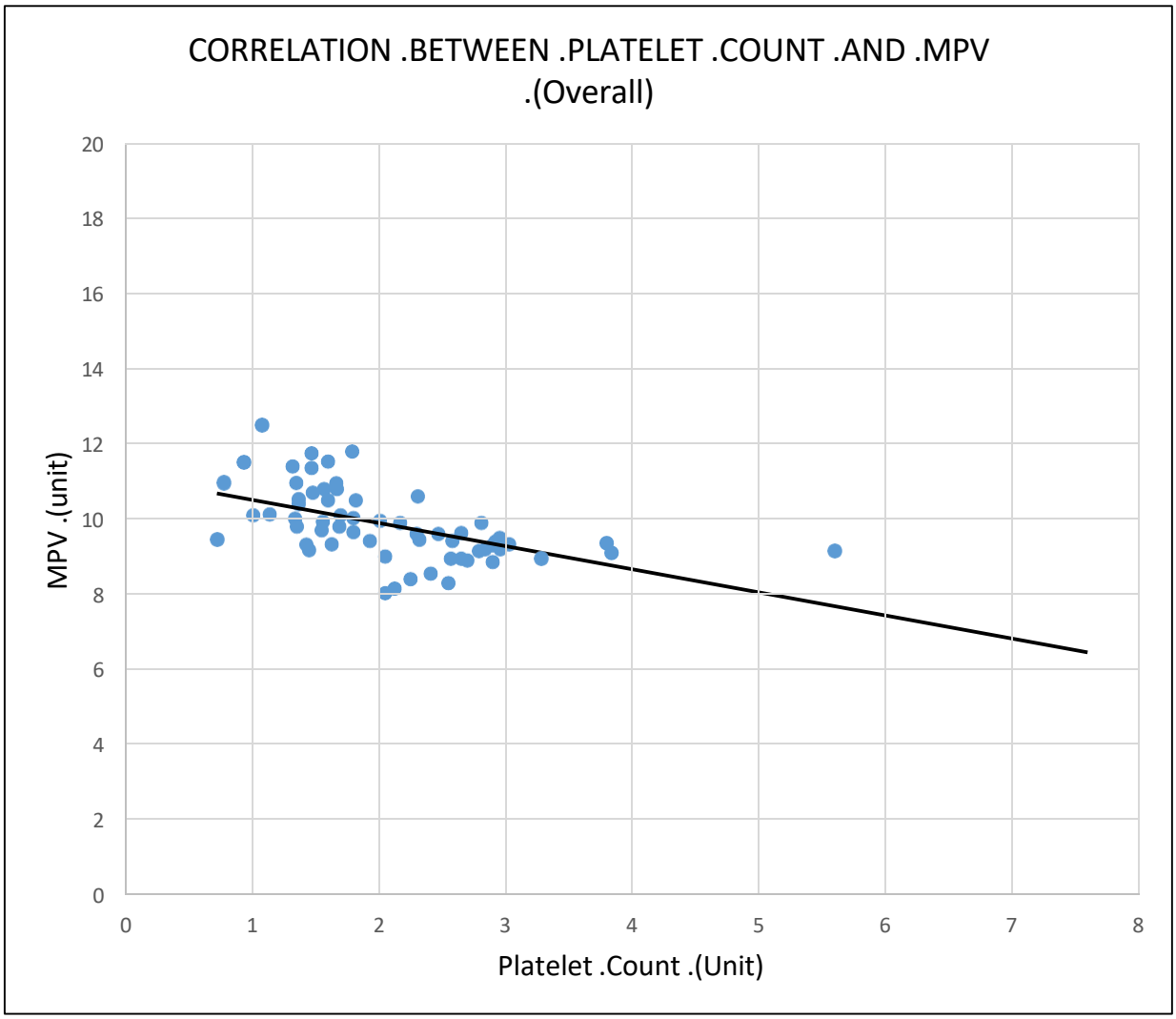


Figure 1. Correlation Between Platelet Count and MPV (Overall)

| | MPV | |
|---|---|---|
| | r Value | p Value |
| Platelet Count | 0.52 | <0.0001* |

Table 3. Correlation Between Platelet Count and MPV within **age group 0-20 years**

* Significant Value at the 0.05 level

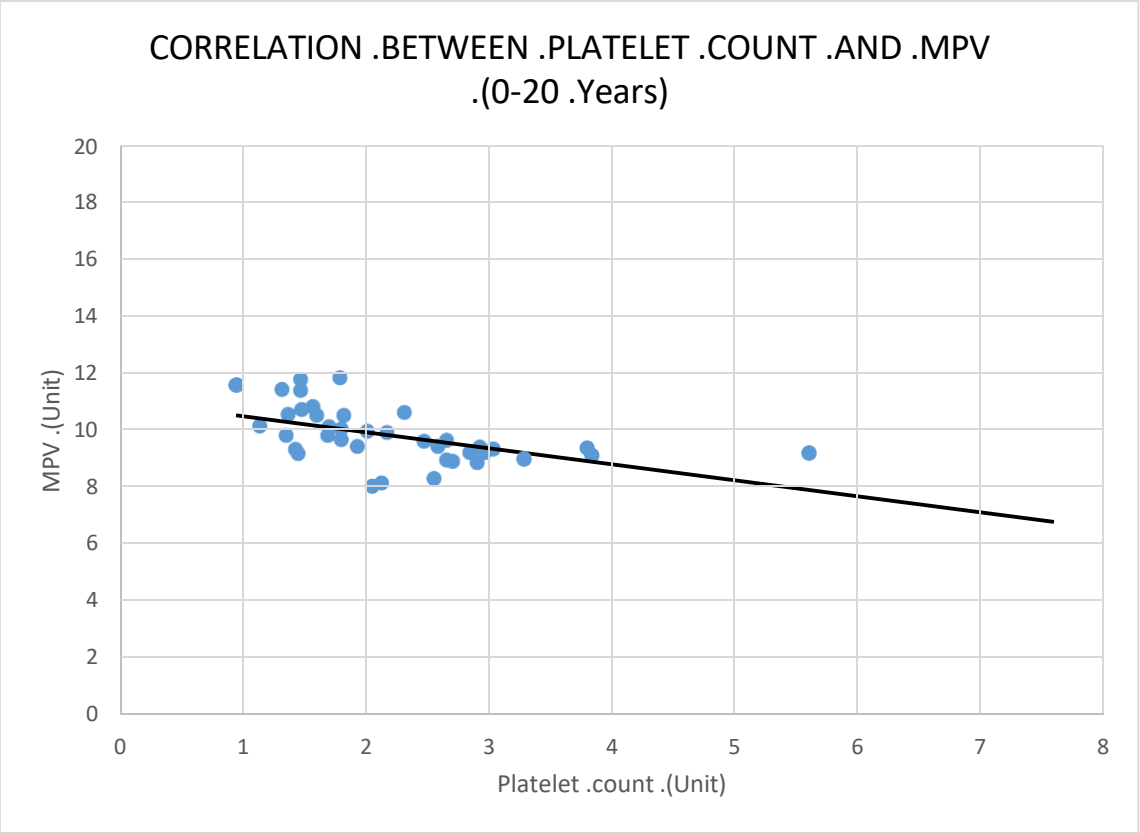


Figure 2. Correlation Between Platelet Count and MPV (0-20 Years)

| | MPV | |
|---|---|---|
| | r Value | p Value |
| Platelet Count | 0.66 | <0.0001* |

Table 4. Correlation Between Platelet Count and MPV within the **age group 21-40 years**

* Significant Value at the 0.05 level

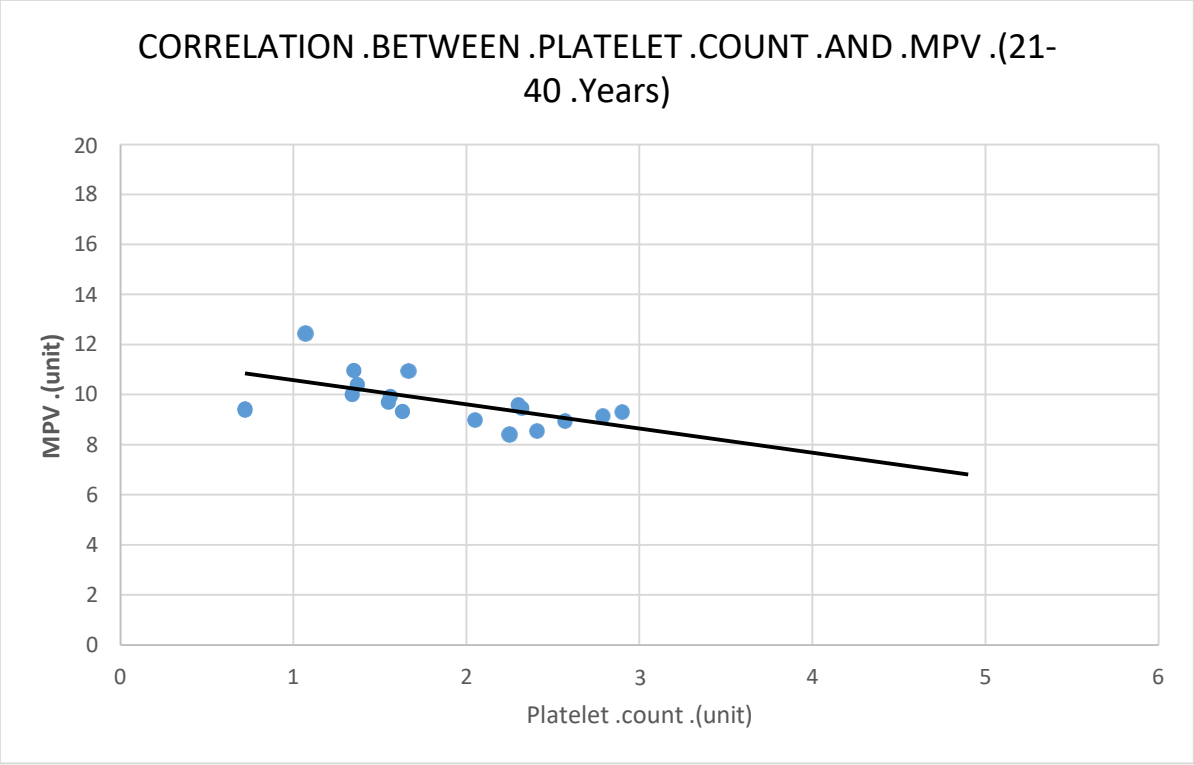


Figure 3. Correlation Between Platelet Count and MPV (21-40 Years

| | MPV | |
|---|---|---|
| | r Value | p Value |
| Platelet Count | 0.681 | 0.003* |

Table 5. Correlation Between Platelet Count and MPV within the **age group 41-60 years**

* Significant Value at the 0.05 level

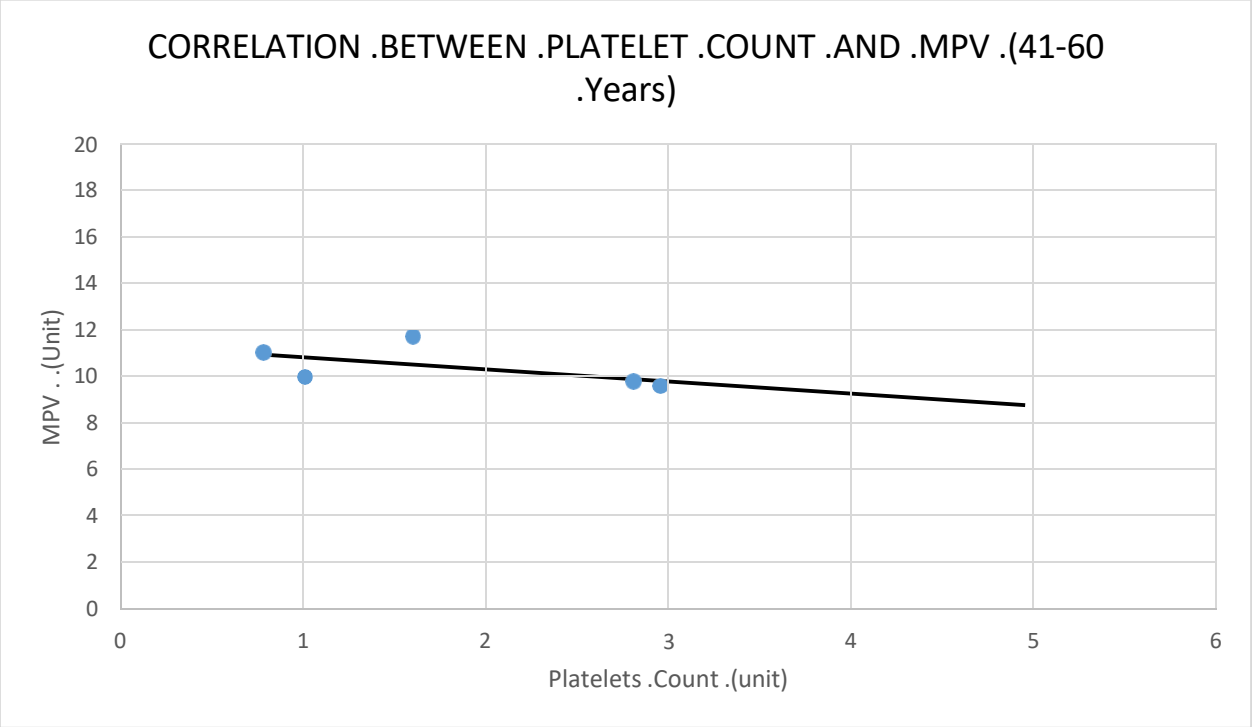


Figure 4. Correlation Between Platelet Count and MPV (41-60 Years)

## Discussion

This study was conducted to assess the association between mean platelet volume (MPV) and platelet count in patients with dengue and to determine its prognostic significance. A total of 62 seropositive patients with laboratory-confirmed dengue fever were included in the study.

A statistically significant correlation was found between MPV and platelet count ($r = 0.65$, $p < 0.0001$). Significant correlations were seen across various age groups. These findings imply that MPV changes parallel platelet count variations during the course of dengue infection.

The findings of this investigation regarding the link between MPV and total platelet counts in dengue fever and dengue hemorrhagic fever patients concur with prior publications in the field. Multiple prior investigations have reported an inverse association between MPV and platelet counts, suggesting that modifications in platelet size may reflect variations in platelet generation and consumption during dengue infection.

Srichaikul et al. [7], in a study conducted in Thailand, provided valuable insights into platelet activity during the acute phase of dengue hemorrhagic fever. Their findings demonstrated a significant negative correlation between MPV and platelet counts, underscoring the potential utility of platelet indices as prognostic markers for disease severity. Likewise, Asha et al. [8] reported that platelet indices, including MPV, as simple risk predictors for severe dengue, highlighting the clinical relevance of platelet parameters in risk stratification and management decisions. According to Maedel et al, thrombocytopenia stimulates the bone marrow to produce immature platelets with larger size, increasing MPV value [13]. Similarly, S R Dewi *et al* found that elevated mean platelet volume was associated with worsening dengue infection. [14]

Diana et al [9] reported that Mean platelet volume may be a predictor of PC recovery in dengue patients. PC recovery is expected when a patient has an MPV of 13.58 fL, an onset time of 4.5 d and a neutrophils count of 150 µL. Thus, the present study provides additional supportive evidence that MPV can serve as a useful prognostic marker irrespective of geographical location [8]. Furthermore, Manoharan A et al [11] suggested that mean platelet volume (MPV) can act as an indicator of inflammation, disease activity, and response to anti-inflammatory therapy in chronic inflammatory conditions, highlighting its broader clinical relevance. Mukker,et al [15] study also supports Platelet indices are useful parameters in dengue infection. Other than platelet count, PDW, MPV, platecrit are useful to monitor dengue fever. s

The present study adds more evidence to existing research by showing a strong and statistically significant link between mean platelet volume (MPV) and platelet count in confirmed dengue patients. Unlike earlier studies that focused mainly on severe dengue or limited age groups, this study examined confirmed dengue cases across various ages, giving a wider view of platelet behavior during infection. The notable correlation ($r = 0.65$, $p < 0.0001$) shows MPV can be simple, cheap and easily available hematological parameter for monitoring disease progression. The result of this study adds more evidence the clinical importance of MPV as a useful prognostic marker in routine examination of dengue patients.

## CONCLUSION

In conclusion, the results of this study suggest that mean platelet volume (MPV), when monitored serially along with platelet count, may serve as a useful and cost-effective prognostic marker in dengue infection. The observed correlation between MPV and platelet count indicates that dynamic changes in MPV could assist in predicting significant thrombocytopenia and identifying patients at risk of progression to severe disease.

Considering the substantial global burden of dengue, as recognized by the World Health Organization, the incorporation of commonly available hematological parameters such as MPV into routine clinical practice may improve early risk stratification and guide timely clinical intervention, particularly in resource-limited setting

### Limitation

We had a shortfall in our study as initially, the study was conducted with a relatively small sample size of 62 patients, which may restrict the generalizability of the results. Next the study was carried out at a single center, and therefore the findings may not reflect the broader population and serial monitoring of mean platelet volume (MPV) throughout the course of infection was not performed, which could have provided better insight into the flucation of platelet indices during dengue infection. Additionally, other platelet parameters such as platelet distribution width (PDW) and plateletcrit (PCT) were not examined in detail, which may also have prognostic significance.

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