

# Comprehensive Evaluation of Hematological Profile Alterations in Dengue Fever Patients and Their Association with Disease Severity: A Hospital-Based Cross-Sectional Study

Mahesh Singh Danu<sup>1\*</sup>, Abhishek Roy<sup>2</sup>, Mohit Singh Kalyanwat<sup>3</sup>

<sup>1\*</sup> Assistant Professor, Allied Healthcare Sciences, Vivekananda Global University (Corresponding Author). Email: [maheshdanu32@gmail.com](mailto:maheshdanu32@gmail.com)

<sup>2</sup> Associate Professor, Allied Healthcare Sciences, Vivekananda Global University

<sup>3</sup> Lab Technician, Reliable Diagnostic Centre, Jaipur

## ABSTRACT

### Background

Dengue fever is a quickly spreading virus spread by mosquitoes that puts a heavy strain on healthcare systems, especially in tropical and subtropical areas. One of the most accurate laboratory markers for dengue infection diagnosis, tracking, and prognosis is haematological abnormalities.

### Goal

To analyse changes in dengue patients' haematological profiles and determine how they relate to the severity of the illness.

### Methods

One hundred individuals with laboratory-confirmed dengue were included in a hospital-based cross-sectional study. Analysis was done on haematological parameters such as platelet count, haematocrit, total leukocyte count, differential leukocyte count, and red blood cell indices. SPSS software was used for statistical analysis. Associations were found using the chi-square test and ANOVA, with  $p < 0.05$  being regarded as statistically significant.

### Findings

88% of patients had thrombocytopenia, 44% had leukopenia, and a sizable percentage of severe cases had hemoconcentration. Platelet counts less than  $50,000/\mu\text{L}$  were strongly correlated with bleeding symptoms ( $\chi^2 = 18.72$ ,  $p < 0.001$ ). The demographic group most impacted was young adults (16–30 years old).

### Conclusion

Haematological parameters—specifically, platelet count and hematocrit—are essential markers for forecasting the severity of the illness and directing therapeutic treatment for dengue patients.

**Keywords:** Dengue fever, thrombocytopenia, leukopenia, hematocrit, CBC, dengue severity, hematology

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### Introduction

Dengue fever, which is caused by four different dengue virus serotypes (DENV-1 to DENV-4), is one of the most serious vector-borne viral infections in the world. It is mostly spread by the bite of an infected *Aedes aegypti* mosquito. Dengue has changed over the last few decades from a rare virus to a hyperendemic illness that now affects more than 100 nations globally. An estimated 390 million dengue infections occur worldwide each year, with roughly 96 million individuals showing clinical symptoms. A significant amount of this load falls on India because of the country's fast urbanisation, unpredictable environment, and insufficient vector control measures. One of the defining

characteristics of dengue infection is its wide clinical spectrum, ranging from asymptomatic infection to severe life-threatening conditions such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Hematological abnormalities play a central role in this spectrum and are essential for disease monitoring.

The most widely available and reasonably priced laboratory test is the complete blood count (CBC). Leukopenia, haemoconcentration, and thrombocytopenia are important markers of the course of the illness. Regional diversity in haematological symptoms is still a problem despite a great deal of research. Therefore, in order to

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produce localised evidence and enhance therapeutic results, hospital-based research is crucial.

**Materials and Procedures**

**Research Design-** A cross-sectional observational design was used in this investigation, which was carried out in a tertiary care facility.

**Study Environment-** Standardised laboratory methods were guaranteed because the investigation was carried out in a tertiary care teaching hospital with state-of-the-art diagnostic facilities.

**Time Spent Studying-** In order to account for seasonal fluctuations in dengue incidence, the study was conducted across a 12-month period.

**Research Participants-** There were one hundred dengue patients with laboratory confirmation.

**Method of Sampling-** To find eligible participants, consecutive sampling was employed.

**Requirements for Inclusion**

- Dengue infection confirmed (NSI/IgM positive)
- At least eighteen years old
- Both sexes

**Requirements for Exclusion**

- Haematological conditions
- Prolonged liver damage
- Immunosuppressive treatment
- Inadequate documentation

**Data Gathering Method-** A standardised proforma was used to gather patient data, which included:

- The demographics
- Clinical characteristics
- The parameters of the laboratory

## Research in the Lab

Haemoglobin (Hb)

Haematocrit (HCT)

- TLC, or total leukocyte count
- DLC, or differential leukocyte count

The platelet count

- RBC indices (RDW, MCV, MCH, and MCHC)

## Analysis of Statistics

Software: SPSS

- The tests that were used

Chi-square

ANOVA and correlation analysis

- $P < 0.05$  indicates significance.

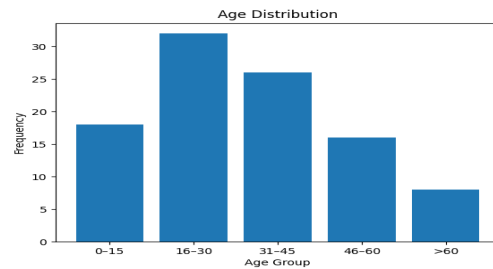
## Results

**Age Distribution-** The highest incidence was observed in the 16–30 years age group (32%), indicating increased exposure among young adults.

Table 1: Age Distribution

Age Group	Frequency	Percentage
0–15	18	18%
16–30	32	32%
31–45	26	26%
46–60	16	16%
>60	8	8%

Figure 1: Age Distribution Graph



**Gender Distribution-** Male predominance (62%) was observed, likely due to increased outdoor exposure.

## Hematological Findings

- Thrombocytopenia: 88%
- Leukopenia: 44%
- Severe thrombocytopenia (<50,000): 26%

## Dengue Hematological Study

### Platelet Distribution

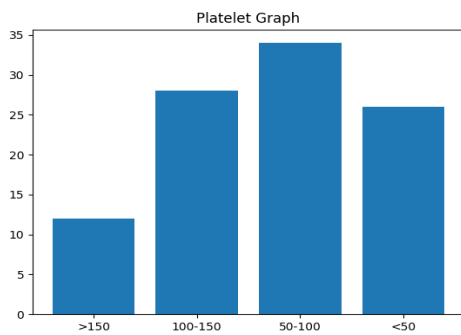
Range	Frequency
>150k	12
100k–150k	28
50k–100k	34
<50k	26

## Leukocyte Count

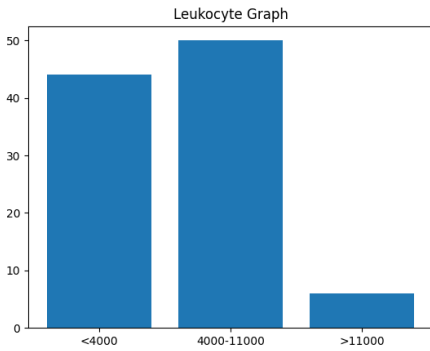
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Range	Frequency
<4000	44
4000–11000	50
>11000	6

Figures 2-



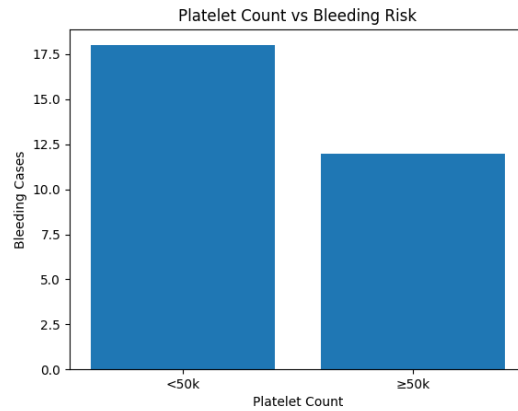
Figures 3-



**Table: Platelet Count vs Bleeding**

Platelet Count	Bleeding Present	Bleeding Absent	Total
<50,000	18	8	26
≥50,000	12	62	74
Total	30	70	100

**Figure:4- Platelet Count vs Bleeding Risk**



### Statistical Analysis

A significant association was found between platelet count and bleeding:

$$\chi^2 = 18.72$$

$$p < 0.001$$

This confirms platelet count as a strong prognostic marker.

### Discussion

The current study's results provide compelling evidence for the accepted theory of dengue pathogenesis. The most prevalent haematological disorder, affecting 88% of patients, was found to be thrombocytopenia. This is in accordance with international research and WHO recommendations that highlight bone marrow suppression and platelet destruction as important mechanisms.

Its prognostic relevance is shown by the statistically substantial correlation between bleeding symptoms and severe thrombocytopenia. Hemorrhagic consequences were significantly more common in patients with platelet counts below 50,000/ $\mu$ L. Leukopenia observed in 44% of patients reflects bone marrow suppression and viral cytopathic effects. It also serves as an early diagnostic marker, especially in differentiating dengue from bacterial infections.

Given that young adults make up the working population, the prevalence of dengue within this demographic points to a substantial socioeconomic burden.

Overall, the results support the significance of haematological monitoring in dengue management and are in line with international literature.

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## Clinical Implications

- CBC is a low-cost, high-value diagnostic tool
- Platelet monitoring helps predict bleeding risk
- Hematocrit monitoring helps detect plasma leakage
- Early intervention reduces mortality

## Conclusion

According to the study's findings, haematological parameters—specifically, platelet count and hematocrit—are accurate indicators of the severity of dengue illness. Severe thrombocytopenia is a crucial clinical care characteristic since it is strongly linked to bleeding problems.

## Limitations

- Single-center study
- Limited sample size
- Lack of serotype analysis
- No longitudinal follow-up

## Future Scope

- Multicentric studies
- Inclusion of biomarkers
- AI-based prediction models
- Serotype-based analysis

## Discussion

The report emphasises how crucial haematological monitoring is in dengue. Particularly when the platelet count is less than 50,000/ $\mu$ L, it is a powerful predictor of bleeding risk. For early intervention, routine CBC monitoring is crucial.

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