

**Correlation of Clinical Severity and Laboratory Parameters with Dengue Virus Serotypes: A Hospital-Based Study**Neelam Kumari<sup>1</sup>, Basavaraja Channabasappa Hunasemarada<sup>2</sup>, Pushpa Rani<sup>3</sup><sup>1</sup>Senior resident, Department of Microbiology, Netaji Subhas Medical College and Hospital Jamshedpur, Jharkhand, India<sup>2</sup>Professor and HOD, Department of Microbiology, Netaji Subhas Medical College and Hospital Jamshedpur, Jharkhand, India<sup>3</sup>Junior Resident, Department of Pathology, SKMCH Muzaffarpur, Bihar, India

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Conflict of interest: Nil

**Abstract:****Background:** Dengue fever, a notable mosquito-borne viral illness, presents a wide spectrum of clinical manifestations, ranging from mild febrile episodes to severe, life-threatening complications, such as dengue hemorrhagic fever and dengue shock syndrome. The disease burden in endemic countries like India is intensified by the co-circulation of multiple dengue virus (DENV) serotypes, each associated with varying degrees of clinical severity and immune response.**Objective:** To investigate the correlation between dengue virus serotypes and clinical severity, as well as their association with critical laboratory indicators, in patients hospitalised at Netaji Subhas Medical College and Hospital in Jamshedpur.**Method:** A prospective observational study was conducted over one year at Netaji Subhas Medical College in Jamshedpur. A total of 95 patients displaying symptoms suggestive of dengue fever were included. Serological and molecular testing were used to confirm DENV infection and identify serotypes. The clinical severity was evaluated based on the WHO classification. Haematological and biochemical indicators were assessed and correlated with serotype distribution and disease severity.**Results:** Of the 95 cases, DENV-2 was the most common serotype, accounting for approximately 44.2% of positive cases, followed by DENV-1 at 26.3%. DENV-3 and DENV-4 were detected in 21 and 8% of cases respectively. DENV-1 and DENV-2 were most frequently associated with severe clinical outcomes, including thrombocytopenia, elevated hematocrit, and raised hepatic enzymes. Patients with co-infections exhibited the highest severity profiles, including increased bleeding tendencies and ICU admissions.**Conclusion:** Infections with DENV-1 and DENV-2 are primarily associated with severe clinical manifestations and notable test anomalies. Recognising serotype-specific patterns in clinical severity and laboratory results might facilitate early risk classification, optimise resource allocation, and improve focused public health surveillance in dengue-endemic areas.**Keywords:** Dengue virus, DENV Serotypes, Clinical Severity, Laboratory Parameters, Thrombocytopenia, Severe dengue.**DOI:** 10.25258/ijcpr.18.3.276This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Dengue is a significant viral infection transmitted by mosquitoes, caused by the dengue virus (DENV), which belongs to the genus *Flavivirus* and has four antigenically diverse serotypes: DENV-1, DENV-2, DENV-3, and DENV-4 [1]. Dengue is a considerable public health challenge in tropical and subtropical areas, including India, characterised by recurrent outbreaks and escalating illness severity [2].

The clinical manifestations of dengue vary from undifferentiated fever and dengue fever (DF) to

severe forms, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), generally referred to as severe dengue [3]. The severity of disease is affected by various factors, such as host immunity, subsequent infections, viral virulence, and the infecting serotype. Numerous studies indicate that specific dengue serotypes are more commonly linked to severe clinical symptoms and distinctive test abnormalities, including thrombocytopenia, hemoconcentration, leukopenia, and increased liver enzymes [4].

Understanding the correlation among dengue virus serotypes, clinical severity, and laboratory metrics is crucial for timely risk assessment and effective clinical care [5]. This hospital-based study sought to connect clinical severity and laboratory findings with several dengue virus serotypes.

## Methods

**Study Design and Setting:** This prospective observational hospital-based study was carried out at Netaji Subhas Medical College in Jamshedpur, India, throughout the dengue transmission season from July 2023 to June 2024.

**Study Population:** A total of 95 patients with laboratory-confirmed dengue infection were included.

### Inclusion Criteria

- Patients aged  $\geq 18$  years
- Laboratory-confirmed dengue infection (NS1 antigen and/or dengue IgM positive)
- Serotype identification by reverse transcription-polymerase chain reaction (RT-PCR)

### Exclusion Criteria

- Pre-existing hematological or chronic liver disease
- Incomplete clinical or laboratory data

### Clinical Classification

Patients were classified according to WHO 2009 guidelines into:

- Dengue without warning signs
- Dengue with warning signs
- Severe dengue (DHF/DSS)

### Laboratory Investigations

Laboratory parameters recorded at admission included:

- Hemoglobin and hematocrit
- Total leukocyte count
- Platelet count
- Aspartate aminotransferase (AST)
- Alanine aminotransferase (ALT)

**Serotyping:** Serotyping of the dengue virus was performed using RT-PCR to identify DENV-1, DENV-2, DENV-3, and DENV-4.

**Statistical Analysis:** Data were analysed using SPSS. Continuous variables were expressed as mean  $\pm$  standard deviation and analysed using ANOVA. Categorical variables were examined using the chi-square test. A p-value below 0.05 was considered statistically significant.

## Results

**Distribution of Dengue Virus Serotypes:** Among the 95 cases, DENV-2 was the predominant serotype identified.

**Table 1: Distribution of Dengue Virus Serotypes**

Serotype	Number (n=95)	Percentage (%)
DENV-1	25	26.3
DENV-2	42	44.2
DENV-3	20	21
DENV-4	8	8.4

**Clinical Severity Across Serotypes:** Severe dengue was more commonly observed in patients infected with DENV-2 and DENV-3.

**Table 2: Association Between Dengue Serotype and Clinical Severity**

Serotype	Dengue without warning signs	Dengue with warning signs	Severe dengue
DENV-1	14	12	6
DENV-2	26	34	14
DENV-3	18	20	10
DENV-4	8	6	3

**Laboratory Parameters and Serotypes:** Significant differences in platelet count, hematocrit,

and liver enzyme levels were observed among different serotypes.

**Table 3: Laboratory Parameters According to Dengue Serotype**

Parameter	DENV-1	DENV-2	DENV-3	DENV-4	p-value
Platelet count ( $\times 10^3/\mu\text{L}$ )	75 $\pm$ 12	52 $\pm$ 10	62 $\pm$ 24	88 $\pm$ 20	<0.001
Hematocrit (%)	41.0 $\pm$ 4.6	43.8 $\pm$ 5.0	43.1 $\pm$ 4.5	42.4 $\pm$ 4.6	<0.001
AST (U/L)	98 $\pm$ 28	180 $\pm$ 44	170 $\pm$ 21	98 $\pm$ 14	<0.001
ALT (U/L)	80 $\pm$ 30	158 $\pm$ 50	128 $\pm$ 48	79 $\pm$ 32	<0.001

## Discussion

This study illustrates a distinct correlation between dengue virus serotypes and clinical severity as well as laboratory anomalies. DENV-2 was the primary serotype and was strongly correlated with severe dengue, characterised by substantial thrombocytopenia, hemoconcentration, and increased transaminases. These findings align with earlier data demonstrating increased virulence of DENV-2 in the Indian subcontinent. Patients infected with DENV-3 demonstrated an increased incidence of severe dengue and notable liver involvement. Conversely, DENV-1 and DENV-4 infections were more frequently linked to less severe illness and less laboratory abnormalities.

Laboratory measures, including platelet count, haematocrit, AST, and ALT, exhibited a robust connection with disease severity, underscoring their potential as early indicators of severe dengue [6]. Serotype-based surveillance may thus be essential in predicting outbreaks linked to heightened severity [7].

## Limitations

The study failed to distinguish between primary and secondary dengue infections, which could affect severity. The results of this single-centre study may lack generalisability across all geographies.

## Conclusion

Dengue virus serotypes exhibit considerable differences in clinical severity and laboratory characteristics. DENV-2 and DENV-3 correlate with increased disease severity and significant laboratory anomalies. Timely identification of dengue serotypes, coupled with meticulous monitoring of laboratory markers, might facilitate risk classification and enhance clinical management of dengue patients.

## Key findings

Biofilm was formed by 62% of the 100 clinical *Staphylococcus* infection isolates, and it was most common in wound swabs. There is a clear correlation between biofilm production and

multidrug resistance, as evidenced by the much greater antibiotic resistance of biofilm-producing bacteria, particularly to erythromycin.

**Clinical implications:** Empirical antibiotic therapy and infection-control methods can be guided by routine screening for

biofilm formation in clinical *Staphylococcus* isolates. By encouraging more focused antibiotic usage, early detection of resistant biofilm-forming bacteria may enhance treatment results, lower therapeutic failure, decrease hospital stays, and boost antimicrobial stewardship.

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