

## A Study of Serological and Clinical Correlation of Dengue in a Tertiary Care Hospital in Gujarat

Siddhi Bharatbhai Mesariya<sup>1</sup>, Kanizfatma Durani<sup>2</sup>, Khushbu Nagar<sup>3</sup>, Jayshri Pethani<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Microbiology, ESIC Medical College, Naroda, Ahmedabad, India

<sup>2</sup>Assistant Professor, Department of Microbiology, ESIC Medical College, Naroda, Ahmedabad, India

<sup>3</sup>Assistant Professor, Department of Pathology, ESIC Medical College, Naroda, Ahmedabad, India

<sup>4</sup>Professor and Head, Smt. N. H. L. Municipal Medical College, Ahmedabad, India

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Corresponding author: Dr. Kanizfatma Durani

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### Abstract

**Background:** Dengue is a rapidly emerging mosquito-borne viral infection and a major public health concern in tropical countries like India. The disease presents with a wide clinical spectrum ranging from mild febrile illness to severe dengue with hemorrhage and shock. Early diagnosis using serological markers and correlation with clinical features is essential for timely management and reduction of morbidity and mortality. Objective was to determine the incidence of dengue infection and to study the correlation between clinical features and serological findings in a tertiary care hospital.

**Methods:** This prospective observational study was conducted over a period of two years in a tertiary care hospital. A total of 5168 clinically suspected dengue cases were included. Serum samples were tested using NS1 antigen detection (ELISA and rapid methods) for early cases and IgM capture ELISA for later stages of illness. Demographic, clinical, and laboratory data were recorded and analyzed using descriptive statistics.

**Results:** Out of 5168 suspected cases, 292 (6%) were serologically confirmed. Majority of patients had dengue without warning signs (78%), followed by dengue with warning signs (15%) and severe dengue (7%). The most affected age group was 21–30 years (38%), with male predominance (56%). Fever (100%), chills (95%), headache (87%), vomiting (65%), and myalgia (48%) were the most common presenting features. Hemorrhagic manifestations were observed in 46% of cases. NS1 antigen positivity (52%) was higher than IgM (42%), indicating early presentation in most patients. Thrombocytopenia was noted in 40% and leucopenia in 24% of cases, with platelet counts correlating with disease severity.

**Conclusion:** Dengue predominantly affects young adults and shows peak incidence during monsoon season. NS1 antigen is a valuable early diagnostic marker. Clinical and serological correlation is crucial for early detection and appropriate management, which helps in preventing complications and reducing disease burden.

**Keywords:** Dengue, NS1 antigen, IgM ELISA, Serological correlation, Clinical profile, Thrombocytopenia, Leucopenia, *Aedes aegypti*.

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### Introduction

Dengue is one of the most rapidly spreading mosquito-borne viral infections worldwide and poses a significant public health challenge, particularly in tropical and subtropical regions. It is caused by four antigenically distinct serotypes of dengue virus belonging to the family Flaviviridae. The disease spectrum ranges from asymptomatic infection and mild febrile illness to severe manifestations such as dengue hemorrhagic fever and dengue shock syndrome, which can be life-threatening. [1,2]

The global burden of dengue has increased markedly over recent decades, with millions of cases reported

annually. India remains an endemic region, with frequent outbreaks especially during monsoon and post-monsoon seasons due to favorable breeding conditions for *Aedes aegypti*. Early diagnosis and appropriate clinical management are crucial in reducing morbidity and mortality associated with dengue infection. [3,4]

Laboratory diagnosis plays a pivotal role in confirming dengue infection, particularly through detection of NS1 antigen in early illness and IgM antibodies in later stages. Correlation between clinical features and serological markers aids in better understanding disease progression and

severity. [5,6] However, variability in clinical presentation and laboratory findings often complicates diagnosis and management. Therefore, this study was undertaken to evaluate the serological and clinical correlation of dengue infection in a tertiary care hospital, aiming to improve early diagnosis and guide effective patient management.

### Materials and Methods

This prospective observational study was conducted at a tertiary care hospital over 2 years after obtaining institutional ethical approval. A total of 5168 clinically suspected dengue cases were included. Blood samples were collected following standard aseptic precautions, and serum was separated and stored under appropriate conditions until testing.

Inclusion criteria comprised all clinically suspected dengue cases as per WHO 2009 guidelines. Exclusion criteria included hemolysed, lipemic, icteric, contaminated, or insufficient samples. Patients not fulfilling clinical criteria or having inadequate specimens were excluded from the study to ensure data reliability. Serological diagnosis was performed using NS1 antigen detection (ELISA and

rapid immunochromatographic methods) for samples collected within 5 days of illness, and IgM capture ELISA for samples collected after 5 days. Data regarding demographic profile, clinical presentation, and laboratory findings were recorded systematically.

Statistical analysis was carried out using descriptive statistics. Categorical variables were expressed as percentages, while continuous variables were summarized appropriately. Correlation between clinical features and serological findings was assessed to determine patterns of disease presentation and severity.

### Results

A total of 5168 clinically suspected dengue cases were evaluated during the study period, out of which 292 cases were serologically confirmed, yielding an overall incidence of 6%. The clinical classification based on WHO 2009 criteria showed that the majority of patients had dengue without warning signs (78%), followed by dengue with warning signs (15%) and severe dengue (7%).

**Table 1: Incidence and Clinical Spectrum of Dengue (n = 5168)**

| Parameter                      | Number | Percentage |
|--------------------------------|--------|------------|
| Total suspected cases          | 5168   | —          |
| Confirmed dengue cases         | 292    | 6%         |
| Dengue (D)                     | 227    | 78%        |
| Dengue with warning signs (DW) | 44     | 15%        |
| Severe dengue (SD)             | 21     | 7%         |

The age distribution revealed that the most commonly affected group was 21–30 years (38%), followed by 11–20 years (19%) and >50 years (15%). The least affected group was 41–50 years (3%). The age range varied from 2 months to 84 years. Male patients (56%) outnumbered females (44%). Geographically, the majority of cases were

from Ahmedabad (97%), with Juhapura (28%), Naroda (12.28%), Shahpur (10%), Vasna (8%), and Vatva (5%) being the most affected areas. Seasonal distribution showed a peak incidence during monsoon and post-monsoon months (August to November). Most patients presented within 5 days of onset of illness.

**Table 2: Demographic and Epidemiological Profile of Dengue Patients (n = 292)**

| Parameter         | Category | Number (%) |
|-------------------|----------|------------|
| Age group (years) | 0–10     | 43 (14%)   |
|                   | 11–20    | 56 (19%)   |
|                   | 21–30    | 111 (38%)  |
|                   | 31–40    | 25 (8%)    |
|                   | 41–50    | 11 (3%)    |
|                   | >50      | 46 (15%)   |
| Gender            | Male     | 163 (56%)  |
|                   | Female   | 129 (44%)  |
| Seasonality       | Aug–Nov  | Majority   |

Clinically, all patients presented with fever (100%), followed by chills and rigors (95%), headache (87%), nausea/vomiting (65%), and myalgia (48%). Other symptoms included bleeding manifestations (46%), joint pain (39%), retro-orbital pain (38%), abdominal pain (29%), and skin rash (28%). Signs

of severity such as hepatomegaly (18%), ascites (17%), pleural effusion (13%), and shock (6%) were also observed. Among bleeding manifestations, petechiae/purpura/ecchymosis were the most common (35%), followed by hematemesis (5%), gum bleeding (4%), and melena (0.34%)

**Table 3: Clinical Features of Dengue Patients (n = 292)**

| Clinical Feature        | Number (%) |
|-------------------------|------------|
| Fever                   | 292 (100%) |
| Chills and rigors       | 280 (95%)  |
| Headache                | 248 (87%)  |
| Nausea/Vomiting         | 191 (65%)  |
| Muscle pain             | 140 (48%)  |
| Bleeding manifestations | 135 (46%)  |
| Joint pain              | 113 (39%)  |
| Retro-orbital pain      | 111 (38%)  |
| Abdominal pain          | 85 (29%)   |
| Skin rash               | 83 (28%)   |
| Hepatomegaly            | 54 (18%)   |
| Ascites                 | 51 (17%)   |
| Pleural effusion        | 40 (13%)   |
| Shock                   | 19 (6%)    |

Serologically, NS1 antigen was positive in 52% of cases, IgM antibodies in 42%, and both NS1 and IgM in 6% of patients, indicating early presentation in most cases. Hematological analysis revealed leucopenia (<4000/cumm) in 24% of cases, while 76% had normal leukocyte counts. Thrombocytopenia (<1.5 lakh/cumm) was observed in 40% of patients and was more pronounced in

dengue with warning signs and severe dengue groups. Platelet count analysis showed that in dengue without warning signs, counts were mostly between 1–1.5 lakh/cumm. In contrast, dengue with warning signs and severe dengue patients predominantly had platelet counts below 1 lakh/cumm, with a significant proportion below 50,000/cumm in severe cases.

**Table 4: Serological and Hematological Profile (n = 292)**

| Parameter               | Category       | Number (%) |
|-------------------------|----------------|------------|
| <b>Serology</b>         | NS1            | 152 (52%)  |
|                         | IgM            | 121 (42%)  |
|                         | NS1 + IgM      | 19 (6%)    |
| <b>Leucocyte count</b>  | <4000/cumm     | 70 (24%)   |
|                         | >4000/cumm     | 222 (76%)  |
| <b>Thrombocytopenia</b> | <1.5 lakh/cumm | 117 (40%)  |

## Discussion

Dengue is one of the most prevalent arboviral infections worldwide and remains a significant public health concern in India, particularly during monsoon and post-monsoon seasons.

In the present study, the overall seropositivity rate was 6%, which is comparable to the findings of Parameshwarappa Jyothi et al. (11.92%) but lower than the 50% reported by Suchita Vikas Ingale et al. This variation may be attributed to differences in study design, geographical distribution, and seasonal factors influencing vector density. [7,8]

The present study demonstrated a male predominance (56%), which is consistent with studies by Swetha et al. (58%), Patankar et al. (65%), and Habib et al. (59%). This gender difference may be due to increased outdoor exposure and occupational activities among males, leading to higher risk of mosquito bites. [9] Age-wise distribution showed that the most affected group was 21–30 years (38%), which aligns with findings from Laul et al. (41.7%) and Ghosh et al. (56%). This

suggests that dengue predominantly affects the economically productive age group, emphasizing its socioeconomic impact. [10]

Seasonal variation observed in this study, with peak incidence during August to November, correlates with studies by Ghosh et al., Swetha et al., and Bandyopadhyay et al., highlighting the role of climatic conditions in vector breeding. Increased rainfall and humidity during this period favor the proliferation of *Aedes aegypti*, thereby increasing transmission rates. [11]

In terms of clinical spectrum, dengue without warning signs constituted the majority (78%), followed by dengue with warning signs (15%) and severe dengue (7%).

These findings are comparable to Kaur et al., who reported 87%, 7%, and 5% respectively. This similarity suggests a consistent pattern in disease severity across different populations. [12] Fever was the most common presenting symptom (100%), followed by headache (87%), vomiting (65%), and myalgia (48%), which is in agreement with studies

by Patil et al., Mohan et al., Vijay et al., and Laul et al. Retro-orbital pain (38%) and hepatomegaly (18%) were also observed, similar to findings reported by Laul et al. Hemorrhagic manifestations were present in 46% of patients, which is slightly higher than the 40% reported by Karoli et al., possibly indicating variation in disease severity or referral patterns.

Serological analysis showed higher NS1 antigen positivity (52%) compared to IgM (42%), which is consistent with studies by Kulkarni et al. and Parameshwarappa Jyothi et al. This highlights the importance of NS1 antigen detection in early diagnosis, especially within the first 5 days of illness. Combined use of NS1 and IgM improves diagnostic accuracy across different stages of infection. [13]

Hematological findings revealed thrombocytopenia in 40% of cases, particularly in dengue with warning signs and severe dengue groups. This observation is consistent with Mohan et al. and Nishat Hussain et al., who reported similar platelet trends. The pathophysiology involves bone marrow suppression, immune-mediated destruction, and increased peripheral consumption.

Leucopenia was observed in 24% of cases, comparable to Patel BC et al. (29%). [14] Overall, the findings of this study are consistent with existing literature and reinforce the importance of early diagnosis, clinical correlation, and monitoring of hematological parameters in dengue management. Early identification of warning signs and timely intervention can significantly reduce morbidity and prevent progression to severe dengue.

### Conclusion

Dengue presents with a wide clinical spectrum ranging from mild febrile illness to severe life-threatening complications. In this study, 6% of suspected cases were confirmed, with majority being dengue without warning signs. Young males were predominantly affected, with peak incidence during monsoon season. Fever and constitutional symptoms were common, while severe cases showed hemorrhagic manifestations and organ involvement. Thrombocytopenia correlated with disease severity.

Early diagnosis using serological markers and timely supportive management remain essential to reduce morbidity and mortality in dengue patients.

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