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Evaluation of Clinical Profile, Laboratory Parameters, and Outcomes of Pediatric Dengue Infection: A Prospective Observational Study

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ABSTRACT

Background: Dengue is a major mosquito-borne viral infection and an important cause of pediatric morbidity and hospitalization in tropical countries. Early recognition of clinical features and laboratory abnormalities is essential for timely management and prevention of severe complications.

Aim: To evaluate the clinical profile, laboratory parameters, and outcomes of pediatric patients with laboratory-confirmed dengue infection admitted to a tertiary care hospital.

Materials and Methods: This prospective observational study was conducted in the Department of Pediatrics, ESIC Medical College and Hospital, Kalaburagi, Karnataka, India, from January 2025 to January 2026. A total of 100 consecutive children aged 1 month to 18 years with laboratory-confirmed dengue infection (NS1 antigen, dengue IgM antibody, and/or RT-PCR positivity) were included. Demographic characteristics, clinical manifestations, laboratory investigations, radiological findings, treatment details, complications, and outcomes were recorded using a structured case record form. Patients were classified according to the WHO 2009 dengue guidelines. Data were analyzed using SPSS version 26.0, and a p-value <0.05 was considered statistically significant.

Results: Among the 100 patients, 58% were males and the majority (38%) belonged to the 6–10-year age group. Fever was present in all patients, followed by vomiting (61%), headache (52%), abdominal pain (46%), myalgia (39%), and hepatomegaly (29%). According to WHO classification, 49% had dengue without warning signs, 38% had dengue with warning signs, and 13% had severe dengue. The mean platelet count was 72,400 ± 33,600/mm³, while the mean total leukocyte count was 4,650 ± 1,620/mm³, indicating thrombocytopenia and leukopenia as the predominant hematological abnormalities. Elevated AST (86.5 ± 44.3 U/L) and ALT (72.8 ± 37.1 U/L) suggested frequent hepatic involvement. NS1 antigen and IgM antibodies were positive in 71% and 82% of patients, respectively. Hepatomegaly (29%) and gallbladder wall edema (21%) were the commonest ultrasonographic findings. Intravenous fluids were administered to 88% of patients, while 14% required PICU admission. Plasma leakage (17%) and hepatitis (15%) were the most common complications. The mean duration of hospital stay was 5.2 ± 2.1 days. Overall, 97% of patients recovered, 1% were referred to a higher center, and the mortality rate was 2%.

Conclusion: Pediatric dengue predominantly affected school-aged children and was characterized by fever, thrombocytopenia, leukopenia, and elevated liver enzymes. Most patients recovered with timely diagnosis, careful monitoring, and appropriate supportive management based on WHO guidelines. Early identification of warning signs and prompt intervention are essential to reduce complications and improve clinical outcomes.

Keywords: *Dengue fever, Pediatric dengue, Thrombocytopenia, Clinical profile, Laboratory parameters, WHO classification, Outcomes.*

INTRODUCTION

Dengue is one of the most important mosquito-borne viral infections affecting humans and represents a major public health challenge in tropical and subtropical countries. It is caused by four antigenically distinct serotypes of the dengue virus (DENV-1 to DENV-4), belonging to the *Flaviviridae* family, and is primarily transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes. The global burden of dengue has increased dramatically over the past two decades due to rapid urbanization, climate change, increased international travel, and inadequate vector control measures. It is estimated that approximately 390 million dengue infections occur annually, of which nearly 96 million manifest clinically with varying severity (1,2).

India is among the countries contributing substantially to the global dengue burden, with frequent outbreaks reported from almost all states. Pediatric dengue has emerged as a significant cause of hospitalization, particularly during the monsoon and post-monsoon seasons. Children often present with nonspecific symptoms, making early diagnosis difficult. Furthermore, disease progression may be rapid, leading to plasma leakage, hemorrhage, shock, and multiorgan dysfunction if not recognized and managed promptly (3,4).

The clinical spectrum of dengue ranges from asymptomatic infection and uncomplicated dengue fever to severe dengue characterized by severe plasma leakage, severe bleeding, or severe organ dysfunction. The World Health Organization (WHO) revised its dengue classification in 2009, categorizing cases into dengue without warning signs, dengue with warning signs, and severe dengue. This classification facilitates early recognition of patients at risk of deterioration and guides appropriate clinical management (5).

Pediatric patients often exhibit a different clinical profile compared with adults. Fever remains the most consistent symptom, while vomiting, abdominal pain, hepatomegaly, rash, bleeding manifestations, and altered sensorium may occur with varying frequencies. Warning signs such as persistent vomiting, severe abdominal pain, mucosal bleeding, lethargy, hepatomegaly, and clinical fluid accumulation indicate increased risk for severe disease and require close monitoring (6,7).

Laboratory investigations play an essential role in confirming dengue infection and assessing disease severity. NS1 antigen detection is useful during the early febrile phase, whereas IgM antibodies become detectable after approximately five days of illness. Reverse transcriptase polymerase chain reaction (RT-PCR) offers high sensitivity during the viremic phase and assists in serotype identification. Hematological abnormalities such as thrombocytopenia, leukopenia, and hemoconcentration are characteristic laboratory findings, while elevated liver enzymes frequently indicate hepatic involvement (8,9).

Radiological investigations, particularly ultrasonography, are increasingly recognized as valuable tools for detecting plasma leakage before overt clinical deterioration. Gallbladder wall edema, ascites, pleural effusion, hepatomegaly, and splenomegaly are commonly reported sonographic findings associated with severe disease. Early identification of these features enables timely fluid management and reduces complications (10).

Management of pediatric dengue remains primarily supportive, focusing on judicious fluid therapy, careful monitoring of hematocrit and platelet count, early recognition of warning signs, and prompt management of shock and bleeding. Platelet transfusion is generally reserved for patients with significant bleeding rather than isolated thrombocytopenia. Adherence to WHO management guidelines has substantially reduced mortality from severe dengue to less than 1% in experienced centers (5,11).

Despite improvements in diagnosis and treatment, dengue continues to impose considerable morbidity among children in India. Regional variations in clinical presentation, laboratory abnormalities, and disease outcomes necessitate institution-specific studies to better understand disease behavior and optimize patient management. Data from northern Karnataka remain relatively limited, particularly regarding comprehensive evaluation of clinical manifestations, laboratory parameters, and outcomes in hospitalized pediatric patients.

Therefore, the present prospective observational study was undertaken to evaluate the clinical profile, laboratory characteristics, radiological findings, management practices, and outcomes of pediatric patients with laboratory-confirmed dengue infection admitted to a tertiary care teaching hospital. The findings are expected to contribute to early recognition of severe disease, facilitate evidence-based management, and improve clinical outcomes in children with dengue infection.

MATERIALS AND METHODS

Study Design

This prospective observational study was conducted to evaluate the clinical profile, laboratory parameters, and outcomes of pediatric patients with dengue infection admitted to the Department of Pediatrics, ESIC Medical College and Hospital, Kalaburagi, Karnataka, India, over a period of one year, from January 2025 to January 2026.

Study Population

A total of 100 consecutive pediatric patients diagnosed with dengue fever and fulfilling the eligibility criteria were enrolled during the study period.

Inclusion Criteria

- Children aged 1 month to 18 years.
- Patients admitted with clinically suspected dengue infection.
- Laboratory confirmation of dengue infection by one or more of the following:
    - NS1 antigen positivity,
    - Dengue IgM antibody positivity,
    - Dengue RT-PCR positivity.
- Parents or legal guardians providing written informed consent.

Exclusion Criteria

- Patients with confirmed co-infections such as malaria, leptospirosis, typhoid fever, scrub typhus, or bacterial sepsis.
- Children with known haematological disorders affecting platelet count.
- Patients with chronic liver disease, chronic kidney disease, congenital heart disease, malignancy, or immunodeficiency disorders.
- Patients with incomplete clinical or laboratory records.
- Patients whose parents or guardians refused consent.

Sample Size

The study included 100 pediatric patients with laboratory-confirmed dengue infection admitted during the study period. Consecutive sampling was adopted until the required sample size was achieved.

Data Collection

A structured case record form was used to collect demographic, clinical, laboratory, treatment, and outcome data.

The following variables were recorded:

Demographic Characteristics

- Age
- Gender
- Residence (urban/rural)
- Nutritional status

Clinical Profile

- Duration of fever
- Vomiting
- Abdominal pain
- Headache
- Myalgia
- Arthralgia
- Retro-orbital pain
- Rash
- Petechiae
- Bleeding manifestations
- Hepatomegaly
- Splenomegaly
- Ascites
- Pleural effusion
- Shock
- Altered sensorium
- Seizures

Patients were classified according to the World Health Organization (WHO) 2009 Dengue Guidelines into:

- Dengue without warning signs
- Dengue with warning signs
- Severe dengue

Laboratory Investigations

The following investigations were performed at admission and repeated during hospitalisation as clinically indicated:

- Complete blood count (CBC)
- Hemoglobin
- Hematocrit
- Total leukocyte count
- Differential leukocyte count
- Platelet count
- Liver function tests (AST, ALT, serum bilirubin)
- Renal function tests (serum creatinine, blood urea)
- Serum electrolytes
- Coagulation profile (PT/INR and aPTT, where indicated)
- NS1 antigen test
- Dengue IgM and IgG antibodies
- RT-PCR for dengue virus (performed in selected cases when indicated)

Radiological Evaluation

Ultrasonography of the abdomen and chest radiography were performed whenever clinically indicated to detect:

- Ascites
- Pleural effusion
- Gallbladder wall edema
- Hepatomegaly
- Splenomegaly

Treatment Protocol

All patients were managed according to the WHO 2009 Dengue Management Guidelines and institutional treatment protocols. Management included:

- Oral or intravenous fluid therapy
- Antipyretics (paracetamol)
- Monitoring of hematocrit and platelet count
- Blood component therapy when clinically indicated
- Intensive care support for severe dengue cases
- Mechanical ventilation and vasopressor support when required

Outcome Measures

Primary Outcome

- Clinical outcome at discharge (recovered or deceased)

Secondary Outcomes

- Duration of hospital stay
- Requirement for Pediatric Intensive Care Unit (PICU) admission
- Requirement for platelet transfusion
- Requirement for blood transfusion
- Development of complications
- Recovery time
- Mortality

Operational Definitions

- Thrombocytopenia: Platelet count <100,000/mm³.
- Leukopenia: Total leukocyte count <4,000/mm³.
- Hemoconcentration: Hematocrit increase >20% from baseline.
- Severe dengue: Defined according to WHO 2009 criteria, including severe plasma leakage, severe bleeding, or severe organ involvement.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA).

Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR) depending on data distribution. Categorical variables were presented as frequencies and percentages.

Comparisons between groups were performed using:

- Student's *t*-test for normally distributed continuous variables.
- Mann–Whitney *U* test for non-normally distributed continuous variables.
- Chi-square test or Fisher's exact test for categorical variables.

A *p*-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of ESIC Medical College and Hospital, Kalaburagi, Karnataka, India, prior to commencement of the study. Written informed consent was obtained from the parents or legal guardians of all participating children, and assent was obtained from older children whenever appropriate. Confidentiality of patient information was maintained throughout the study in accordance with the ethical principles of the Declaration of Helsinki.

RESULTS AND OBSERVATIONS

Table 1. Demographic Characteristics of the Study Population (n=100)

Variable	Frequency (n)	Percentage (%)
Age Group (Years)		
<1	**5**	**5.0**
1–5	**22**	**22.0**
6–10	**38**	**38.0**
11–18	**35**	**35.0**
Gender		
Male	**58**	**58.0**
Female	**42**	**42.0**
Residence		
Urban	**61**	**61.0**
Rural	**39**	**39.0**

Observation: Majority of patients were males (58%) and belonged to the 6–10 years age group (38%).

Table 2. Clinical Profile of Pediatric Dengue Patients (n=100)

Clinical Feature	Frequency	Percentage (%)
Fever	**100**	**100**
Vomiting	**61**	**61**
Headache	**52**	**52**
Abdominal Pain	**46**	**46**
Myalgia	**39**	**39**
Arthralgia	**24**	**24**
Rash	**19**	**19**
Retro-orbital Pain	**18**	**18**
Bleeding Manifestations	**17**	**17**
Petechiae	**13**	**13**
Hepatomegaly	**29**	**29**
Splenomegaly	**11**	**11**
Ascites	**15**	**15**
Pleural Effusion	**12**	**12**
Shock	**8**	**8**
Altered Sensorium	**5**	**5**
Seizures	**2**	**2**

Observation: Fever was present in all patients, while vomiting and headache were the commonest associated symptoms.

Table 3. WHO Classification of Dengue (n=100)

WHO Classification	Frequency	Percentage (%)
Dengue without Warning Signs	49	49
Dengue with Warning Signs	38	38
Severe Dengue	13	13

Observation: Nearly half of the children had dengue without warning signs, whereas 13% developed severe dengue.

Table 4. Hematological Parameters (n=100)

Parameter	Mean ± SD
Hemoglobin (g/dL)	11.6 ±1.5
Hematocrit (%)	39.8 ±5.4
Total Leukocyte Count (/mm³)	4650 ±1620
Neutrophils (%)	49.8 ±12.4
Lymphocytes (%)	41.6 ±10.8
Monocytes (%)	6.4 ±2.2
Eosinophils (%)	1.8 ±1.1
Basophils (%)	0.4 ±0.2
Platelet Count (/mm³)	72,400 ±33,600

Observation: Thrombocytopenia and leukopenia were the predominant hematological abnormalities.

Table 5. Biochemical Parameters (n=100)

Parameter	Mean ± SD
AST (U/L)	86.5 ±44.3
ALT (U/L)	72.8 ±37.1
Total Bilirubin (mg/dL)	0.89 ±0.42
Blood Urea (mg/dL)	26.7 ±8.9
Serum Creatinine (mg/dL)	0.71 ±0.19
Sodium (mEq/L)	135.4 ±3.8
Potassium (mEq/L)	4.1 ±0.6
Chloride (mEq/L)	101.8 ±3.9

Observation: Elevated liver enzymes were common, whereas renal function and electrolyte values were largely within normal limits.

Table 6. Coagulation Profile and Dengue Diagnostic Tests (n=100)

Parameter	Result
PT (seconds)	13.9 ±2.3
INR	1.14 ±0.21
aPTT (seconds)	35.8 ±6.1
NS1 Antigen Positive	71 (71%)
Dengue IgM Positive	82 (82%)
Dengue IgG Positive	26 (26%)

Observation: IgM antibody positivity was the commonest diagnostic finding, while coagulation abnormalities were mainly observed in severe dengue.

Table 7. RT-PCR Findings for Dengue Virus (n=100)

RT-PCR Result	Frequency (n)	Percentage (%)
Positive	12	12.0
Negative / Not Detected	8	8.0
Not Performed	80	80.0
Total	100	100.0

Observation: RT-PCR was performed in 20 clinically indicated patients. Twelve (60%) tested positive, while eight (40%) were negative. Diagnosis in the remaining patients was established by NS1 antigen and/or IgM serology.

Table 8. Radiological Findings (n=100)

Radiological Finding	Frequency	Percentage (%)
Hepatomegaly	29	29
Splenomegaly	11	11
Gallbladder Wall Edema	21	21

Ascites	**15**	**15**
Right Pleural Effusion	**8**	**8**
Bilateral Pleural Effusion	**4**	**4**
Normal Ultrasound	**38**	**38**
Normal Chest X-ray	**88**	**88**

Observation: Hepatomegaly and gallbladder wall edema were the most frequent ultrasonographic findings.

Table 9. Treatment and Complications (n=100)

Variable	Frequency	Percentage (%)
Intravenous Fluids	**88**	**88**
Oral Fluids	**12**	**12**
Platelet Transfusion	**18**	**18**
Packed RBC Transfusion	**6**	**6**
PICU Admission	**14**	**14**
Mechanical Ventilation	**3**	**3**
Vasopressor Support	**7**	**7**
Plasma Leakage	**17**	**17**
Severe Bleeding	**7**	**7**
Dengue Shock Syndrome	**8**	**8**
Hepatitis	**15**	**15**
Acute Kidney Injury	**4**	**4**
Encephalopathy	**3**	**3**

Observation: Most patients were managed conservatively with intravenous fluids. Plasma leakage and hepatitis were the most common complications.

Table 10. Clinical Outcome (n=100)

Outcome	Frequency	Percentage (%)
Recovered	**97**	**97**
Referred to Higher Centre	**1**	**1**
Death	**2**	**2**
Mean Hospital Stay (Days)	**5.2 ±2.1**	**—**
Duration of Hospital Stay	**Frequency**	**Percentage (%)**
≤3 Days	**22**	**22**
4–6 Days	**55**	**55**
7–10 Days	**18**	**18**
>10 Days	**5**	**5**

Observation: The overall recovery rate was 97%, with a 2% mortality rate. Most children were discharged within 4–6 days of hospitalization.

DISCUSSION

The present prospective observational study evaluated the clinical profile, laboratory parameters, and outcomes of 100 pediatric patients with laboratory-confirmed dengue infection admitted to a tertiary care hospital. The study demonstrated that dengue predominantly affected school-aged children, with fever being the universal presenting symptom. Thrombocytopenia, leukopenia, and elevated hepatic transaminases were the most frequent laboratory abnormalities. Most children had dengue without warning signs and responded well to supportive treatment, resulting in a high recovery rate (97%) and low mortality (2%).

In the present study, the majority of patients belonged to the 6–10-year age group (38%), followed by adolescents aged 11–18 years (35%). Similar age distribution has been reported by Kumar et al. (12), Ahmed et al. (13), and Narayanan et al. (14), who observed that school-aged children are more frequently exposed to mosquito bites because of increased outdoor activities. Male predominance (58%) observed in the present study is also consistent with previous Indian studies, possibly reflecting greater outdoor exposure among boys and healthcare-seeking behavior (12,15).

Fever was observed in all patients, making it the most consistent presenting symptom. Vomiting (61%), headache (52%), and abdominal pain (46%) were the next most frequent complaints. Comparable findings have been reported by Prasad et al. (16), Ratageri et al. (17), and Dhooria et al. (18), who documented fever in nearly all pediatric dengue cases with gastrointestinal symptoms being common warning manifestations. Persistent vomiting and abdominal pain have been identified as predictors of severe dengue due to their association with plasma leakage.

Bleeding manifestations were observed in 17% of patients, while petechiae were present in 13%. Although thrombocytopenia is characteristic of dengue, clinically significant bleeding develops only in a subset of patients. Similar frequencies have been reported by Kalayanarooj (19), who emphasized that bleeding depends on multiple factors including platelet dysfunction, coagulopathy, endothelial injury, and plasma leakage rather than platelet count alone.

According to WHO 2009 classification, 49% of children had dengue without warning signs, 38% had dengue with warning signs, and 13% developed severe dengue. These findings are comparable with reports from multicenter Asian studies demonstrating that only a minority of hospitalized children progress to severe disease when diagnosed and managed early (20). The relatively lower proportion of severe dengue in the present study may be attributed to timely hospital admission and strict adherence to WHO fluid management protocols.

Thrombocytopenia was the most prominent hematological abnormality, with a mean platelet count of 72,400/mm³. Leukopenia (mean TLC 4,650/mm³) was another common finding. Similar observations have been reported by Trung et al. (21) and Laoprasopwattana et al. (22), who identified thrombocytopenia and leukopenia as important laboratory markers of dengue infection. Platelet destruction, bone marrow suppression, and immune-mediated mechanisms contribute to thrombocytopenia, whereas transient suppression of hematopoiesis explains leukopenia during the acute phase.

Elevated AST and ALT levels observed in the present study indicate frequent hepatic involvement in pediatric dengue. AST elevation was more pronounced than ALT, which is a well-recognized pattern in dengue infection because AST is released from both hepatocytes and injured skeletal muscles. Similar findings have been documented by Parkash et al. (23) and Souza et al. (24), who suggested that transaminase elevation correlates with disease severity and duration of hospitalization.

NS1 antigen positivity was observed in 71% of patients, whereas IgM antibodies were positive in 82%, reflecting different stages of illness at presentation. RT-PCR was performed only in selected clinically indicated patients, with positivity in 60% of those tested. These observations agree with WHO recommendations indicating that NS1 antigen is most useful during the first five days of illness, whereas IgM antibodies become detectable later (5). RT-PCR remains the gold standard during early viremia but is often limited by cost and availability in routine clinical practice.

Radiological evidence of plasma leakage was common. Hepatomegaly (29%), gallbladder wall edema (21%), ascites (15%), and pleural effusion (12%) were the predominant imaging findings. Similar ultrasonographic findings have been described by Setiawan et al. (25) and Venkata Sai et al. (26), who reported gallbladder wall edema as an early marker of severe dengue. Ultrasonography therefore serves as a useful adjunct in identifying children at risk of clinical deterioration before overt shock develops.

The majority of children (88%) required intravenous fluid therapy, emphasizing the central role of careful fluid replacement in dengue management. Platelet transfusion was required in only 18% of patients despite universal thrombocytopenia, supporting current evidence that prophylactic platelet transfusion is unnecessary in the absence of significant bleeding. Similar conclusions have been reported by Lye et al. (27) and WHO guidelines (5), which discourage routine platelet transfusion based solely on platelet count.

Complications observed in the present study included plasma leakage (17%), hepatitis (15%), dengue shock syndrome (8%), severe bleeding (7%), acute kidney injury (4%), and encephalopathy (3%). These complications are comparable to previously published pediatric series, where plasma leakage and hepatic dysfunction constitute the most common severe manifestations (18,22,24). Early recognition and aggressive supportive care are crucial in preventing progression to irreversible shock and multiorgan failure.

The mean duration of hospital stay was 5.2 ± 2.1 days, with more than half of the patients discharged within 4–6 days. A recovery rate of 97% and mortality of only 2% reflect favorable outcomes achieved through early diagnosis, continuous monitoring, and adherence to standardized WHO treatment guidelines. Similar survival rates have been reported from tertiary care centers across India where structured dengue management protocols have significantly reduced mortality (5,12,17).

The strengths of the present study include its prospective design, standardized data collection, comprehensive evaluation of clinical, laboratory, and radiological parameters, and use of WHO classification. However, the study has certain limitations. It was conducted at a single tertiary care center with a relatively modest sample size, limiting generalizability. Viral serotyping was not routinely performed, and long-term follow-up after discharge was unavailable. Future multicenter studies involving larger populations and serotype analysis would provide more comprehensive epidemiological information and help identify predictors of severe pediatric dengue.

Overall, the findings of the present study reinforce that early recognition of warning signs, prompt laboratory evaluation, appropriate fluid management, and adherence to WHO treatment guidelines are fundamental to reducing complications and improving outcomes in children with dengue infection.

CONCLUSION

This prospective observational study demonstrated that pediatric dengue predominantly affected school-aged children and commonly presented with fever, vomiting, headache, and abdominal pain. Thrombocytopenia, leukopenia, and elevated liver enzymes were the principal laboratory abnormalities, while hepatomegaly and gallbladder wall edema were the most frequent radiological findings. Most patients had dengue without warning signs and responded well to supportive management according to WHO guidelines, resulting in a high recovery rate (97%) and low mortality (2%). Early recognition of warning signs, timely laboratory evaluation, and appropriate fluid therapy remain crucial for preventing severe complications and improving clinical outcomes in children with dengue infection.

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