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Research Article

Clinical Profile and Outcome of Pediatric Dengue with Hemorrhagic Complications

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ABSTRACT

Background: Dengue is a major mosquito-borne viral disease and an important cause of pediatric morbidity and mortality in India. Hemorrhagic complications in dengue are associated with severe outcomes due to thrombocytopenia, coagulopathy, and vascular leakage. Limited data exist from Karnataka on the clinical profile and outcomes of children with dengue and hemorrhagic manifestations.

Objectives: To evaluate the clinical features, laboratory profile, and outcomes of pediatric dengue patients with hemorrhagic complications, and to compare them with those without hemorrhagic manifestations.

Methods: This hospital-based observational case–control study was conducted in the Department of Pediatrics, Yadgir Institute of Medical Sciences, Karnataka, from April to August 2025. Fifty laboratory-confirmed pediatric dengue patients (aged 1 month–18 years) were enrolled: 25 with hemorrhagic complications (cases) and 25 without (controls), matched for age and sex. Clinical, laboratory, and radiological data were recorded using a structured proforma. Outcomes assessed included mortality, complications, ICU admission, transfusion requirements, and hospital stay.

Results: Hemorrhagic manifestations were present in 50% of patients, with petechiae/purpura (60%), gum bleeding (40%), and epistaxis (28%) being most common. Cases had significantly lower platelet counts (42.6 vs. 88.4 × 10^9/L, $p < 0.001$), higher hematocrit (43.2% vs. 39.6%, $p = 0.01$), and elevated liver enzymes compared to controls. Shock at admission was more frequent in cases (32% vs. 8%, $p = 0.04$). ICU admission (48% vs. 12%, $p = 0.006$), blood product transfusions (60% vs. 8%, $p < 0.001$), and complications (40% vs. 8%, $p = 0.01$) were significantly higher among cases. Mortality was observed in 12% of cases, while no deaths occurred in controls. Median hospital stay was longer in cases (7 vs. 4 days, $p = 0.002$).

Conclusion: Hemorrhagic complications in pediatric dengue are associated with severe thrombocytopenia, hemoconcentration, hepatic dysfunction, increased transfusion needs, prolonged hospitalization, and higher risk of ICU admission. Early recognition of high-risk features and timely supportive management as per WHO guidelines are crucial to improve outcomes.

Keywords: *Dengue, Pediatrics, Hemorrhagic complications, Thrombocytopenia, Outcome*

INTRODUCTION

Dengue is one of the most important mosquito-borne viral diseases affecting humans, caused by the dengue virus (DENV), a flavivirus transmitted primarily by *Aedes aegypti* mosquitoes [1]. Globally, an estimated 390 million dengue

infections occur annually, of which about 96 million manifest clinically [2]. In recent decades, dengue has emerged as a significant public health problem in India, with frequent outbreaks and increasing incidence among children [3].

Pediatric dengue often presents with a wide clinical spectrum, ranging from mild undifferentiated fever to severe forms, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) [4]. Hemorrhagic complications in dengue are characterized by increased vascular permeability, coagulopathy, and thrombocytopenia, which can lead to life-threatening outcomes if not promptly recognized and managed [5]. The World Health Organization (WHO) 2009 classification emphasizes the identification of warning signs to predict disease progression and improve outcomes [6].

Children are particularly vulnerable to severe dengue and hemorrhagic complications due to differences in immune response, smaller physiological reserves, and higher risk of rapid clinical deterioration [7]. Common hemorrhagic manifestations include petechiae, purpura, mucosal bleeding, gastrointestinal hemorrhage, and, in some cases, intracranial bleeding [8]. Predictors of severe disease and mortality include high hematocrit, severe thrombocytopenia, elevated liver enzymes, presence of shock, and multi-organ involvement [9].

Early recognition of high-risk patients and timely institution of appropriate supportive care are crucial in reducing morbidity and mortality [10]. However, there is limited data from certain parts of India, including Karnataka, regarding the clinical profile, laboratory predictors, and outcomes of pediatric dengue with hemorrhagic complications.

This study aimed to assess the clinical features, laboratory profile, and outcomes of pediatric dengue patients with hemorrhagic complications, and to compare them with dengue patients without hemorrhagic manifestations, in a tertiary care center in Yadgir district.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based, observational case–control study was conducted in the Department of Pediatrics at Yadgir Institute of Medical Sciences, Yadgir, Karnataka, between **April 1, 2025, and August 31, 2025**. The institute serves as a tertiary care referral center for both rural and urban populations in the Yadgir district and adjoining areas.

Study Population and Sample Size

A total of **50 pediatric patients**, aged 1 month to 18 years, with laboratory-confirmed dengue infection, were included.

- **Cases (n = 25):** Pediatric dengue patients with hemorrhagic complications.
- **Controls (n = 25):** Pediatric dengue patients without hemorrhagic complications, matched for age and sex.

Inclusion Criteria

Cases:

1. Age between 1 month and 18 years.
2. Laboratory-confirmed dengue infection (NS1 antigen and/or IgM antibody positivity by ELISA).
3. Presence of hemorrhagic manifestations such as petechiae, purpura, gum bleeding, epistaxis, hematemesis, melena, hematuria, or menorrhagia (in post-menarcheal girls).

Controls:

1. Age between 1 month and 18 years.
2. Laboratory-confirmed dengue infection without any hemorrhagic manifestations.

Exclusion Criteria

1. Children with known bleeding disorders (e.g., hemophilia, idiopathic thrombocytopenic purpura).
2. Children with thrombocytopenia due to other causes (e.g., sepsis, leukemia, aplastic anemia).
3. Cases where parental/guardian consent could not be obtained.

Data Collection

A pretested structured proforma was used to collect information on:

- **Demographic data:** Age, sex, and residential status (rural/urban).
- **Clinical presentation:** Duration of fever, type and site of hemorrhage, presence of warning signs (abdominal pain, persistent vomiting, fluid accumulation, mucosal bleed, lethargy, restlessness, hepatomegaly), vital signs, and physical examination findings.
- **Laboratory investigations:** Complete blood count, hematocrit, platelet count, liver and renal function tests, coagulation profile, and dengue serology (NS1, IgM, IgG).
- **Radiological investigations:** Ultrasound abdomen for detection of ascites or organomegaly; chest X-ray if clinically indicated.

Outcome Measures
The primary outcome assessed was **mortality**. Secondary outcomes included duration of hospital stay, requirement for blood product transfusions, ICU admission, and development of complications such as shock, multi-organ dysfunction syndrome (MODS), acute respiratory distress syndrome (ARDS), or encephalopathy.

Management Protocol
All patients were treated according to the **WHO 2009 guidelines** for dengue management. Supportive care included close monitoring, judicious fluid therapy, correction of hematocrit abnormalities, and blood component transfusion where indicated.

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using **SPSS version 26** (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR). Categorical variables were presented as frequencies and percentages.

- Comparisons between cases and controls were performed using **Student's t-test** or **Mann–Whitney U test** for continuous variables and **Chi-square test** or **Fisher's exact test** for categorical variables.
- A p-value < 0.05 was considered statistically significant.

RESULTS AND OBSERVATIONS
A total of **50 pediatric patients** with laboratory-confirmed dengue were included in the study, of which **25 (50%)** had hemorrhagic complications (cases) and **25 (50%)** had no hemorrhagic manifestations (controls).

Table 1: Age and Sex Distribution of Study Population

Age Group (years)	Cases n (%)	Controls n (%)	Total n (%)
<5 years	6 (24.0)	5 (20.0)	11 (22.0)
5–10 years	9 (36.0)	10 (40.0)	19 (38.0)
11–15 years	7 (28.0)	8 (32.0)	15 (30.0)
>15 years	3 (12.0)	2 (8.0)	5 (10.0)
Total	**25 (100)**	**25 (100)**	**50 (100)**
Mean ± SD age	9.6 ± 3.8	9.2 ± 4.1	—

Sex ratio: Among cases, 14 (56.0%) were male and 11 (44.0%) were female (M:F = 1.27:1), while in controls, 13 (52.0%) were male and 12 (48.0%) were female.

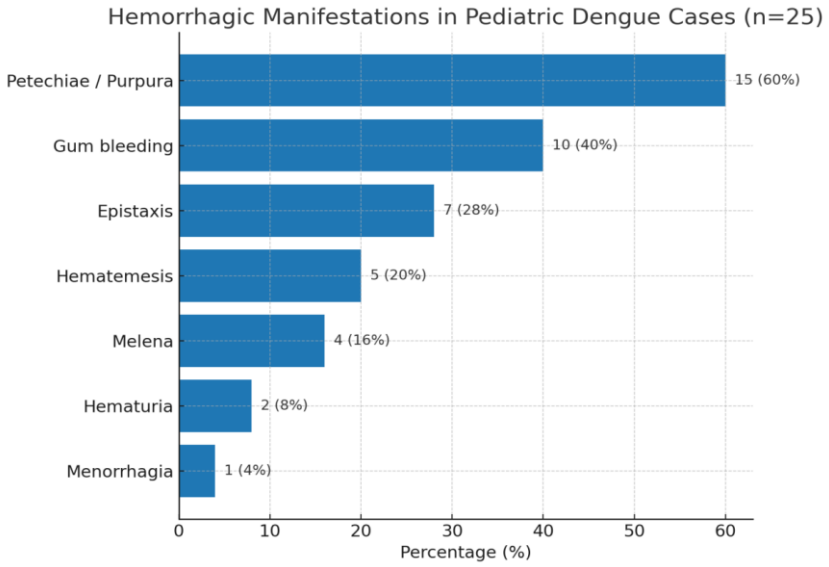
Table 2: Clinical Presentations at Admission

Symptom/Sign	Cases n (%)	Controls n (%)	p-value
Fever	25 (100)	25 (100)	—
Myalgia	19 (76.0)	18 (72.0)	0.75
Abdominal pain	17 (68.0)	12 (48.0)	0.14
Vomiting	16 (64.0)	13 (52.0)	0.39
Rash	14 (56.0)	9 (36.0)	0.15
Hepatomegaly	15 (60.0)	10 (40.0)	0.16
Shock at presentation	8 (32.0)	2 (8.0)	0.04*

*Significant at p<0.05

Table 3: Hemorrhagic Manifestations in Cases (n = 25)

Type of Hemorrhage	Frequency n (%)
Petechiae / Purpura	15 (60.0)
Gum bleeding	10 (40.0)
Epistaxis	7 (28.0)
Hematemesis	5 (20.0)
Melena	4 (16.0)
Hematuria	2 (8.0)
Menorrhagia*	1 (4.0)



Figure; 2 Hemorrhagic Manifestations in Cases (n = 25)

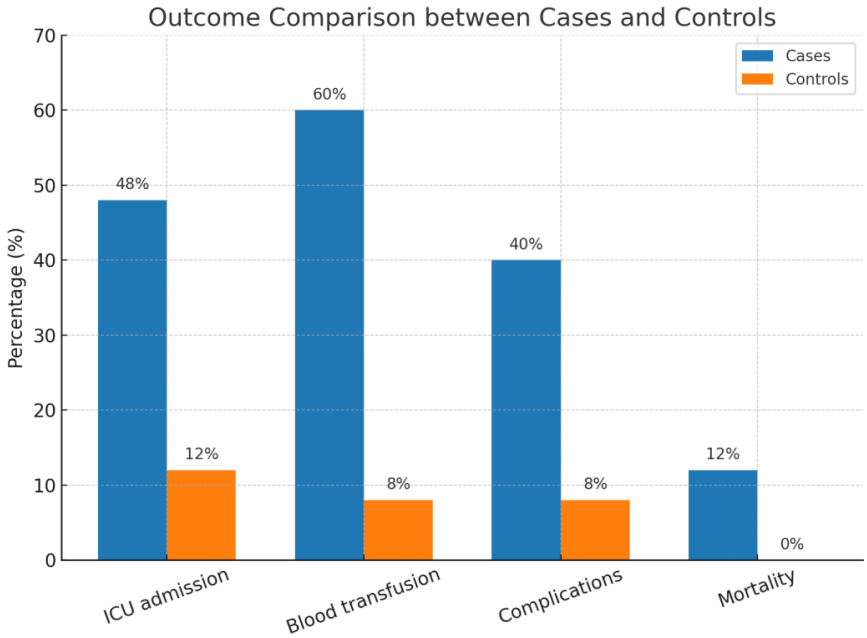
Table 4: Laboratory Parameters in Cases and Controls

Parameter	Cases (Mean ± SD)	Controls (Mean ± SD)	p-value
Hematocrit (%)	43.2 ± 4.8	39.6 ± 4.5	0.01*
Platelet count (×10⁹/L)	42.6 ± 18.3	88.4 ± 25.7	<0.001*
WBC count (×10⁹/L)	4.8 ± 1.6	5.1 ± 1.7	0.47
ALT (U/L)	98.6 ± 34.2	72.5 ± 28.9	0.02*
AST (U/L)	112.3 ± 40.1	86.7 ± 33.8	0.01*

*Significant at p<0.05

Table 5: Outcome of Study Population

Outcome	Cases n (%)	Controls n (%)	p-value
ICU admission	12 (48.0)	3 (12.0)	0.006*
Blood product transfusion	15 (60.0)	2 (8.0)	<0.001*
Complications	10 (40.0)	2 (8.0)	0.01*
Mortality	3 (12.0)	0 (0)	0.07
Median hospital stay (days)	7 (5–9)	4 (3–6)	0.002*



Figure; 2 Outcome of Study Population

DISCUSSION

In this hospital-based case–control study of 50 pediatric dengue patients, we found that hemorrhagic complications occurred in 50% of cases, with petechiae/purpura being the most common manifestation (60%), followed by gum bleeding (40%) and epistaxis (28%). These findings are consistent with reports from other Indian studies, where cutaneous petechiae and mucosal bleeding were the predominant hemorrhagic signs in pediatric dengue [11,12].

The mean platelet count was significantly lower in the hemorrhagic group compared to controls (42.6 vs. 88.4 × 10^9/L, $p < 0.001$), and hematocrit was significantly higher (43.2% vs. 39.6%, $p = 0.01$), indicating hemoconcentration and severe thrombocytopenia as key laboratory correlates of bleeding risk. Similar associations between thrombocytopenia, hemoconcentration, and bleeding severity have been described in Southeast Asian and Indian pediatric cohorts [13,14].

Liver enzyme levels (AST and ALT) were significantly elevated in the hemorrhagic group, suggesting hepatic involvement as part of the disease process. This is in agreement with studies showing that liver dysfunction, possibly due to direct viral injury and immune-mediated damage, is more frequent in severe dengue [15]. Elevated transaminases have also been linked to poor outcomes in children [16].

Clinically, shock at presentation was significantly more frequent among cases (32% vs. 8%, $p = 0.04$), and ICU admission rates were markedly higher (48% vs. 12%, $p = 0.006$). The need for blood product transfusions was significantly greater in cases (60% vs. 8%, $p < 0.001$), reflecting the severity of bleeding and coagulopathy. These observations are supported by previous studies that have identified hemodynamic instability and transfusion requirements as important markers of severe disease and predictors of prolonged hospitalization [17,18].

The mortality rate in our study was 12% among cases, with none in the control group, though the difference did not reach statistical significance ($p = 0.07$), likely due to the small sample size. Mortality in pediatric dengue has been reported to range from 1% to 15% in various Indian and Southeast Asian studies, depending on severity and availability of intensive care facilities [19,20].

Our findings emphasize the importance of early identification of children at risk for hemorrhagic complications—particularly those with marked thrombocytopenia, rising hematocrit, liver enzyme elevation, and early signs of shock. Close monitoring, timely fluid resuscitation, and appropriate use of blood products, as recommended in WHO guidelines [6], remain the cornerstone of management.

Limitations

This study was conducted at a single tertiary care center with a relatively small sample size and short study duration, limiting the generalizability of results. Longitudinal multicentric studies with larger cohorts would provide a more comprehensive understanding of risk factors and outcomes in pediatric dengue with hemorrhagic complications.

CONCLUSION

This study highlights that hemorrhagic complications in pediatric dengue are associated with significant morbidity, increased transfusion requirements, prolonged hospitalization, and higher rates of ICU admission. Petechiae, purpura, gum bleeding, and epistaxis were the most common hemorrhagic manifestations, with severe thrombocytopenia, rising hematocrit, elevated liver enzymes, and shock at presentation serving as important predictors of severity. Although mortality was observed only in the hemorrhagic group, timely recognition and adherence to WHO management guidelines were crucial in improving survival. Strengthening early diagnostic strategies, risk stratification, and supportive care in resource-limited settings can substantially reduce the burden of severe pediatric dengue. Larger multicentric studies are warranted to better define prognostic factors and optimize management protocols.

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