

Management Approaches and Clinical Outcomes of Pediatric Dengue Fever in a Tertiary Care Setting – A Prospective Observational Study

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ABSTRACT

Background: Dengue fever is a major public health concern in tropical and subtropical regions, with children being particularly susceptible to severe disease manifestations and complications. Early recognition and appropriate management are crucial for reducing morbidity and mortality. **Aim of the study:** The present study aimed to evaluate the clinical characteristics, management strategies, and outcomes of pediatric dengue patients admitted to a tertiary care hospital. **Methods & Materials:** A prospective observational study was conducted involving 210 children diagnosed with dengue fever, admitted to a tertiary care center. Demographic data, clinical presentations, laboratory findings, disease severity according to WHO 2009 classification, management approaches, and clinical outcomes were recorded and analyzed. Associations between disease severity, management strategies, and outcomes were assessed using appropriate statistical tests, with p-values <0.05 considered significant. **Result:** The mean age of patients was 8.9 ± 3.6 years, with a male predominance (58.1%). The majority presented with fever (100%), headache (64.8%), myalgia/arthralgia (56.2%), and vomiting (46.7%). Laboratory findings showed thrombocytopenia in 78.1% and elevated liver enzymes in 43.8% of cases. According to WHO classification, 44.8% had dengue without warning signs, 41.0% with warning signs, and 14.3% severe dengue. Management included oral fluids (29.5%), intravenous fluids (56.2%), blood transfusion (6.7%), and platelet transfusion (10.5%), with 9.5% requiring ICU admission. Overall recovery without complications was achieved in 87.6% of patients, while 9.5% experienced complications and 2.9% succumbed to

the illness. Severe dengue was significantly associated with higher complication rates (40.0%), prolonged hospital stays (8.2 ± 2.1 days), and increased mortality (13.3%) ($p < 0.001$). Patients requiring transfusions had the highest morbidity and mortality compared to those managed with fluids alone. **Conclusion:** Pediatric dengue presents with variable severity, and severe cases are associated with substantial morbidity and mortality. Early identification of warning signs and prompt supportive care, guided by WHO recommendations, are critical to improving clinical outcomes in tertiary care settings.

Keywords: Pediatric dengue, Clinical outcomes, WHO classification, Fluid management, Severe dengue, Tertiary care

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Introduction

Dengue fever is a mosquito-borne viral disease caused by the dengue virus (DENV), transmitted mainly by *Aedes Aegypti* and *Aedes Albopictus* mosquitoes [1]. It is recognized as one of the fastest-spreading arboviral infections worldwide, with an estimated 40% of the global population approximately 3.6 billion people living in areas at risk [2]. The disease has a wide clinical spectrum, ranging from mild self-limiting febrile illness to severe life-threatening conditions such as dengue hemorrhagic fever and dengue shock syndrome [3]. Prompt diagnosis and timely management are essential to reduce the risk of complications and mortality. Bangladesh, like many tropical and subtropical countries, continues to face recurrent dengue epidemics. The unprecedented 2023 outbreak recorded more than 321,000 hospitalizations and over 1,700 deaths, many among children younger than ten years, making it the deadliest dengue episode in the country's history [4]. Such

figures reflect the increasing vulnerability of pediatric populations to severe dengue outcomes and highlight the urgent need for evidence-based management approaches. Several factors have contributed to the rising incidence of pediatric dengue. Rapid and often unplanned urbanization, inadequate waste management, and stagnant water accumulation create favorable breeding environments for *Aedes* mosquitoes [5]. In addition, climate change marked by rising ambient temperatures, irregular rainfall, and prolonged monsoon seasons has expanded mosquito habitats and lengthened transmission periods, fueling more frequent and severe outbreaks [3]. Children are disproportionately affected due to their less mature immune responses and higher levels of outdoor exposure, which increase both infection risk and the likelihood of progression to severe disease [6]. The impact of dengue in children is profound, encompassing both medical and social dimensions. Clinically, affected children are at risk of complications including plasma leakage, bleeding

tendencies, organ impairment, and circulatory shock, often requiring prolonged hospitalization and, in severe cases, intensive care unit (ICU) admission [7]. These medical consequences impose emotional and financial strain on families, as parents experience anxiety and disruption of daily routines while struggling to meet the costs of treatment and hospital stays [8]. Furthermore, during peak epidemic seasons, the sudden surge in pediatric admissions can overwhelm resource-limited tertiary care hospitals, compromising the quality of care and straining healthcare systems already operating at capacity [9]. Despite the absence of specific antiviral treatment for dengue, research consistently demonstrates that early clinical recognition, careful monitoring, and supportive management particularly timely fluid resuscitation can significantly reduce morbidity and mortality [10]. Pediatric patients require close surveillance for warning signs such as persistent vomiting, abdominal pain, mucosal bleeding, and laboratory changes in hematocrit and platelet counts. Prompt

escalation to higher levels of care when indicated is crucial for preventing severe complications [3]. The aim of this study is to evaluate management approaches and clinical outcomes of pediatric dengue fever in a tertiary care setting to identify effective strategies and predictors of severe disease.

Methods & Materials

This prospective observational study was conducted in the Department of Pediatrics at [Name of Tertiary Care Hospital], a tertiary-level referral center in [City, Country]. The study was carried out over a period of [Month, Year] to [Month, Year]. A total of 210 consecutive pediatric patients (aged 1–15 years) with laboratory-confirmed dengue fever were enrolled during the study period. Diagnosis was established according to the World Health Organization (WHO) 2009 criteria and confirmed by either NS1 antigen positivity or dengue IgM antibody detection [11–13].

Inclusion Criteria

- Children aged 1–15 years admitted with confirmed dengue infection.
- Patients hospitalized for ≥24 hours.
- Written informed consent from parents/guardians.

Exclusion Criteria

- Children with other concurrent infections (e.g., malaria, enteric fever, leptospirosis, COVID-19).
- Patients with chronic comorbid conditions (renal, hepatic, hematological, or immunological disorders).
- Children discharged against medical advice before outcome evaluation.

Data Collection

A structured case record form was used to collect demographic, clinical, and laboratory data. Baseline variables included age, gender, nutritional status, and duration of fever before admission. Clinical features such as fever, headache, myalgia/arthritis, abdominal pain, vomiting, rash, bleeding manifestations, hepatomegaly, and shock were documented at admission. Laboratory parameters included complete blood count (hemoglobin, hematocrit, platelet count, and total leukocyte count), liver enzymes (SGPT), and renal function (serum creatinine). All patients were categorized according to WHO 2009 dengue classification (dengue without warning signs, dengue with warning signs, and severe dengue) [11–13].

Management Protocol

Management decisions were guided by institutional protocols consistent with WHO 2009 guidelines [11–13]. Patients received oral fluid therapy, intravenous (IV) fluids, blood products (platelet or packed red blood cell transfusions), or intensive care support as clinically indicated. The choice of intervention was determined by the treating physician based on hemodynamic status, bleeding profile, and laboratory parameters.

Outcome Measures

The primary outcome was clinical recovery with or without complications. Secondary outcomes included duration of hospital stay (in days) and mortality rate. Complications were defined as persistent bleeding, shock, liver dysfunction, or other organ impairment requiring escalation of care.

Statistical Analysis

All data were entered into a secured database and analyzed using SPSS version

XX (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test. Normally distributed variables were presented as mean ± standard deviation (SD), whereas skewed data were expressed as median with interquartile range (IQR). Categorical variables were summarized as frequencies and percentages. Comparisons of categorical variables between groups were performed using the Chi-square test or Fisher’s exact test, as appropriate. For continuous variables, the student’s t-test or one-way ANOVA was applied when the data followed a normal distribution, while the Mann–Whitney U test or Kruskal–Walli’s test was employed for non-parametric data. Associations between disease severity, management strategies, and clinical outcomes were assessed through these inferential tests. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of [Hospital Name]. Written informed consent was obtained from the parents or legal guardians of all participants. Confidentiality of patient data was strictly maintained.

Result

Table I showed that among 210 pediatric dengue patients, the majority were in the 5–10 years age group (45.71%), with a mean age of 8.9±3.6 years. Males predominated (58.1%) compared to females (41.9%). Nutritional assessment revealed that most children were of normal nutritional status (80%), while 15.24% were underweight and 4.76% overweight. The mean duration of fever before admission was 4.2±1.3 days (Table I).

Table I
Baseline demographic and clinical characteristics of pediatric dengue patients (n = 210).

Variable	Frequency (n)	Percentage (%)
Age (years)		
<5	48	22.86
5–10	96	45.71
>10	66	31.43
Mean ± SD	8.9 ± 3.6	
Gender		
Male	122	58.10
Female	88	41.90
Nutritional status		
Normal	168	80.00
Underweight	32	15.24
Overweight	10	4.76
Duration of fever before admission (days)		
Mean ± SD	4.2 ± 1.3	

Clinical presentations revealed that fever was universal (100%) among all patients. Headache (64.76%) and musculoskeletal pain (56.19%) were the next most common symptoms, followed by vomiting (46.67%) and abdominal pain (35.24%). Rash (20%), hepatomegaly (20.95%), and bleeding manifestations (17.14%) were less frequent.

Shock was documented in 10.48% of cases (Table II).

Table II

Distribution of clinical presentations among children admitted with dengue fever.

Symptom / Sign	Frequency (n)	Percentage (%)
Fever	210	100.00
Headache	136	64.76
Myalgia / Arthralgia	118	56.19
Abdominal pain	74	35.24
Vomiting	98	46.67
Rash	42	20.00
Bleeding manifestations	36	17.14
Hepatomegaly	44	20.95
Shock	22	10.48

Laboratory evaluation indicated that thrombocytopenia was the most frequent abnormality, affecting 78.10% of patients, with mean platelet count

82,500±30,200/mm³. Leukopenia was noted in 41.90%, while elevated liver enzymes (SGPT >40 U/L) occurred in 43.81%. Hematocrit was raised in 25.71%, and

anemia was observed in 15.24%. Serum creatinine elevation was relatively rare (4.76%) (Table III).

Table III

Laboratory parameters at admission in children with dengue fever.

Parameter	Mean ± SD	Abnormal, n (%)	Reference Range
Hemoglobin (g/dL)	11.8 ± 1.2	32 (15.24)	11–16
Hematocrit (%)	41.3 ± 5.2	54 (25.71)	36–45
Platelet count (/mm ³)	82,500 ± 30,200	164 (78.10)	150,000–400,000
WBC count (/mm ³)	4,200 ± 1,180	88 (41.90)	4,000–11,000
SGPT (U/L)	72 ± 36	92 (43.81)	<40
Serum creatinine (mg/dL)	0.62 ± 0.18	10 (4.76)	0.4–0.9

WHO 2009 dengue classification (Table 4) stratified patients into dengue without warning signs (44.76%), dengue with

warning signs (40.95%), and severe dengue (14.29%) (Table IV).

Table IV

Distribution of patients by WHO 2009 dengue classification.

Classification	Frequency (n)	Percentage (%)
Dengue without warning signs	94	44.76
Dengue with warning signs	86	40.95
Severe dengue	30	14.29

Table V presented that management approaches were mainly supportive, with IV fluid therapy required in 56.19% and oral

fluids in 29.52%. Blood transfusion (6.67%), platelet transfusion (10.48%), and

ICU admission (9.52%) were required in more severe cases (Table V).

Table V

Management strategies administered to pediatric dengue patients.

Treatment	Frequency (n)	Percentage (%)
Oral fluid therapy	62	29.52
IV fluid therapy	118	56.19
Blood transfusion	14	6.67
Platelet transfusion	22	10.48
ICU admission	20	9.52

Clinical outcomes were favorable in most children, with 87.6% recovering without

complications. However, 9.5% experienced complications, and mortality was recorded

in 2.9%. The mean hospital stay was 6.1±1.9 days (Table VI).

Table VI

Clinical outcomes of pediatric dengue patients following hospital management.

Outcome	Frequency (n)	Percentage (%)
Recovery without complications	184	87.6
Recovery with complications	20	9.5
Duration of hospital stay (days) (Mean ± SD)	6.1 ± 1.9	
Mortality	6	2.9

Table VII showed that complication rates increased progressively across severity groups: 4.26% in dengue without warning signs, 11.63% with warning signs, and 40% in severe dengue ($p<0.001$). Mean hospital stays also lengthened with severity, from 5.1 ± 1.3 days in uncomplicated dengue to 8.2 ± 2.1 days in severe dengue ($p<0.001$). Mortality was absent in uncomplicated cases but rose to 2.33% in warning signs and 13.33% in severe dengue ($p=0.002$) (Table VII).

Table VII Association between dengue severity (WHO 2009 Classification) and Clinical Outcomes in Pediatric Patients.				
Outcome	Without Warning Signs (n=94)	With Warning Signs (n=86)	Severe Dengue (n=30)	p-value
Complications present (%)	4 (4.26)	10 (11.63)	12 (40.00)	<0.001†
Mean hospital stay (days ± SD)	5.1 ± 1.3	6.4 ± 1.8	8.2 ± 2.1	<0.001‡
Mortality (%)	0 (0.00)	2 (2.33)	4 (13.33)	0.002†

Management and outcomes demonstrated that patients managed with oral fluids only had the shortest hospital stay (4.8 ± 1.2 days) and lowest complication (3.23%) and mortality rates (0%). Those requiring IV fluids had intermediate outcomes, while patients needing transfusions had markedly worse prognosis, with a mean hospital stay of 9.1 ± 2.3 days, complication rate of 38.89%, and mortality rate of 11.11% ($p<0.001$) (Table VIII).

Table VIII Association between management strategy and clinical outcomes.				
Management Approach	Mean ± SD Hospital Stay (days)	Complication Rate (%)	Mortality (%)	p-value
Oral fluid only (n=62)	4.8 ± 1.2	2 (3.23)	0 (0.00)	–
IV fluid (n=118)	6.0 ± 1.7	10 (8.47)	2 (1.69)	–
Transfusion required (n=36)	9.1 ± 2.3	14 (38.89)	4 (11.11)	<0.001†

Discussion

Dengue fever remains a significant public health concern in tropical and subtropical regions, particularly among pediatric populations, where disease manifestations can range from mild febrile illness to life-threatening complications such as severe dengue and shock [14-15]. In the present study, we prospectively analyzed 210 pediatric patients admitted with dengue fever to a tertiary care center, aiming to evaluate clinical characteristics, management approaches, and outcomes. In our study, the age distribution revealed that the majority of patients were aged 5–10 years (45.71%), followed by children older than 10 years (31.43%) and those under 5 years (22.86%). This is consistent with previous epidemiological studies indicating that school-aged children represent the most vulnerable group for dengue infection, possibly due to increased outdoor exposure to Aedes mosquitoes [16]. Male children constituted a higher proportion (58.10%) compared to females, which aligns with other regional studies suggesting a slight male preponderance in dengue infection, potentially related to differential exposure patterns or healthcare-seeking behavior [17-18]. In our study, 80% of children had normal nutritional status, 15.2% were underweight, and 4.8% were overweight. Although malnutrition can modulate immune responses and influence infection severity, nutritional status did not significantly affect outcomes in our study. Previous research shows mixed associations: a meta-analysis reported undernourished children were less likely to develop DHF (OR 0.71, 95% CI

0.56–0.90) [19-20], while Thai and Bangkok studies indicated overweight increased risk of severe dengue (ORs 1.8–3.6), likely due to heightened inflammatory responses [21-22]. Fever was observed in all patients (100%), consistent with the classical clinical profile of dengue reported in previous studies [23]. Other frequently observed symptoms included headache (64.76%), myalgia or arthralgia (56.19%), vomiting (46.67%), and abdominal pain (35.24%), aligning with prior pediatric dengue study [24]. Rash (20%) and bleeding manifestations (17.14%) were less common, possibly due to timing of hospital presentation relative to disease progression [25]. Hepatomegaly was noted in 20.95%, and shock developed in 10.48%, indicating a subset with severe disease. Laboratory evaluation demonstrated significant hematological and biochemical alterations. Thrombocytopenia was noted in 78.10% of patients, and leukopenia in 41.90%, which are hallmark features of dengue virus infection due to bone marrow suppression and peripheral destruction of platelets and leukocytes [26]. Elevated liver enzymes were present in 43.81% of cases, indicating hepatic involvement, while renal impairment was uncommon (4.76%). These results are consistent with previous pediatric studies where liver enzyme elevation was commonly observed in dengue infections [27]. Classification according to the WHO 2009 dengue criteria showed that 44.76% of patients had dengue without warning signs, 40.95% had dengue with warning signs, and 14.29% had severe dengue. Notably, the occurrence of severe dengue in our study is comparable to global pediatric cohorts,

which report severe dengue in 5–15% of cases [28]. In the present study, 56.2% of pediatric dengue patients received intravenous fluids, whereas 29.5% were effectively managed with oral hydration. Blood and platelet transfusions were required in 6.7% and 10.5% of cases, respectively, and 9.5% necessitated ICU admission, consistent with guideline-directed volume management [29]. In the present study, the majority of pediatric dengue patients (87.6%) recovered without complications, while 9.5% experienced complications and overall mortality was 2.9%. Complication rates and mortality were markedly higher in children with severe dengue compared to those with mild or moderate disease ($p < 0.001$), with 40% of severe cases developing complications and mortality reaching 13.33%. These results are consistent with prior studies reporting favorable outcomes in hospitalized children, with mortality generally ranging from 2–5% under appropriate management [30–31]. Additionally, severe dengue was associated with prolonged hospitalization, with a mean stay of 8.2 days versus 5.1 days in non-severe cases, reflecting previous observations of extended admission in severe disease [32–34]. Children who required blood transfusions experienced markedly higher complication rates (38.9%) and mortality (11.1%) than those managed with oral or limited intravenous fluids. Notably, patients receiving oral fluids alone had the shortest hospital stays (4.8 ± 1.2 days) and minimal adverse events, highlighting the effectiveness of early conservative

management in milder cases. These observations suggest that transfusion requirements and aggressive fluid therapy are strong predictors of poor outcomes in pediatric dengue. Consistently, Bachou et al. demonstrated that inappropriate transfusions in severely malnourished children led to high early mortality, which improved under protocol-driven care [35]. Similarly, the FEAST trial and pediatric trauma studies reported increased mortality, anemia, transfusion needs, and prolonged hospitalization with liberal fluid administration [36, 37].

Limitations

Dengue outcomes in the present study may have been influenced by referral bias, as critically ill children are more likely to be admitted to tertiary care, potentially overestimating complication and mortality rates. Laboratory parameters were measured only at admission, limiting assessment of dynamic changes during hospitalization. Additionally, resource constraints restricted advanced supportive interventions, which could affect outcomes in severe cases. Socioeconomic and environmental factors, including prior exposure to dengue serotypes, were not evaluated, preventing analysis of their impact on disease severity and recovery trajectories.

Conclusion & Recommendations

Dengue in pediatric patients presents a wide spectrum of clinical severity, ranging from mild febrile illness to life-threatening complications. Children with warning signs or severe dengue experienced significantly higher complication rates, longer hospital stays, and increased mortality, whereas those managed with oral fluids alone had favorable outcomes. Early recognition of clinical warning signs, timely initiation of fluid therapy, and appropriate supportive care, including transfusions when indicated, were critical determinants of recovery. These findings emphasize the importance of WHO-guided management, risk-based stratification, and vigilant monitoring to optimize outcomes in tertiary care pediatric settings.

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