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Clinical and Laboratory Profile of Fatal Dengue Case: A Retrospective Analysis

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Abstract
Background: *Dengue remains a major public health concern in tropical regions, with fatal outcomes often linked to severe clinical manifestations and laboratory abnormalities. Early identification of high-risk patients is crucial for reducing mortality.*
Aim of the study: *To describe the clinical and laboratory profiles of fatal dengue cases and identify features associated with early versus late mortality.*
Methods: *A retrospective observational study was conducted at a tertiary care hospital in Bangladesh, including 26 laboratory-confirmed fatal dengue cases. Data on demographics, clinical presentation, laboratory parameters, and complications were extracted from medical records using a structured form. Descriptive and comparative analyses were performed using SPSS version 26. Continuous variables were summarized as mean ± SD or median (IQR), and categorical variables as frequencies and percentages. Associations between early (≤48 hours) and late (>48 hours) fatalities were assessed using Chi-square, Fisher's exact, and Mann–Whitney U tests; odds ratios (OR) with 95% confidence intervals (CI) were calculated.*
Result: *The majority of deaths occurred in adults aged 18–40 years (42.3%), with females accounting for 57.7%. Shock at admission (57.7%), multi-organ dysfunction (50%), severe plasma leakage (65.4%), and cardiac arrest (88.5%) were common. Laboratory findings included thrombocytopenia (median 27×10³/μL), elevated liver enzymes (SGOT median 256 U/L), renal impairment (38.5%), coagulopathy, and metabolic acidosis. Early fatalities were significantly associated with shock on admission (OR 9.0, p=0.01).*
Conclusion: *Fatal dengue is characterized by shock, severe plasma leakage, multi-organ involvement, and significant hematologic and biochemical derangements. Early recognition of these high-risk features and prompt ICU care are essential to reduce mortality. SPSS-based statistical analysis facilitated identification of clinical and laboratory predictors of early death.*
Keywords: *Fatal dengue, Clinical profile, Laboratory profile, Dengue shock syndrome, Retrospective study, Mortality predictors*

I. INTRODUCTION

Dengue is a mosquito-borne viral disease that can cause mild symptoms or progress to severe, life-threatening forms such as dengue hemorrhagic fever and dengue shock syndrome [1]. Worldwide, the mortality rate for hospitalized cases ranges from 0.2% to 2.6%, and an estimated 390 million cases occur annually, especially in tropical and subtropical regions [2]. In Bangladesh, as of early October 2025, about 49,907 cases and 212 deaths were reported nationwide since January. Management of fatal dengue cases centers on early recognition, aggressive supportive care with intravenous fluids, and close monitoring for complications such as shock, severe liver dysfunction, metabolic acidosis, and multi-organ failure [1,4]. Platelet transfusions and fresh frozen plasma are reserved for patients with severe bleeding or coagulopathy. Still, routine use is not recommended, as most bleeding is not directly related to platelet count [1]. Optimizing management includes prompt diagnosis, vigilant monitoring for warning signs, and timely intervention for organ dysfunction, while research continues into new therapies such as immunomodulators, antivirals, and improved vaccines to further reduce mortality [1,5]. Excessive fluid administration may precipitate pulmonary edema and exacerbate clinical outcomes, particularly in patients who remain unresponsive to initial resuscitation. In cases of refractory shock, transition to colloid solutions or blood products should be considered to optimize hemodynamic stability [6,7]. Secondary hemophagocytic lymphohistiocytosis (HLH) is a rare but potentially fatal complication; early recognition and treatment with steroids or IVIG can improve outcomes [8]. Diabetes mellitus and hypertension significantly increase the risk of developing severe dengue and related complications, including higher mortality rates [9].

Renal disease, male sex, and laboratory markers like increased hematocrit with low platelets, abdominal pain, vomiting, and hepatomegaly are associated with severe outcomes [10]. Most dengue cases are mild and can be managed with rest, adequate oral fluid intake, and acetaminophen for fever and pain. Non-steroidal anti-inflammatory drugs (NSAIDs) and aspirin should be avoided due to the risk of bleeding. In moderate to severe cases, especially when warning signs or complications like dehydration, bleeding, or shock develop, hospitalization is required for close monitoring and intravenous fluid therapy. Careful fluid management is crucial to avoid both dehydration and fluid overload, which can worsen outcomes [11,12]. Severe dengue (dengue hemorrhagic fever or shock syndrome) may require blood transfusions, intensive care, and organ support. Early recognition and prompt intervention are vital to reduce mortality. Blood products are reserved for significant bleeding or profound thrombocytopenia [12,13]. Research is ongoing into antiviral drugs, immunotherapies, and adjunctive treatments such as herbal remedies and integrated approaches, but these are not yet standard care. Vector control and vaccination remain key preventive strategies [14]. The study aimed to describe the clinical and laboratory characteristics of fatal dengue cases and identify features at presentation or during care associated with death.

II. METHODOLOGY & MATERIALS

This retrospective observational study was conducted at the Department of Medicine, at a tertiary care center in Bangladesh. The study period spanned from 2022 to 2024.

Inclusion and Exclusion criteria

The study included all patients with laboratory-confirmed dengue infection who died during hospitalization at the study center. During the study period, a total of 26 fatal dengue cases were identified and included in the analysis. Dengue infection was diagnosed based on positive NS1 antigen, dengue IgM/IgG serology, or RT-PCR, following the World Health Organization (WHO) 2009 criteria for dengue diagnosis. Patients with incomplete medical records or uncertain cause of death were excluded.

Data Collection

Data for this study were collected retrospectively from electronic medical records and physical patient charts using a structured data extraction form. The variables collected included demographic information (age, sex, and comorbidities), clinical presentation at admission (day of illness, vital signs, presence of shock, and ICU requirement), and detailed symptomatology such as fever, myalgia, vomiting, abdominal pain, bleeding manifestations, hepatomegaly, altered mental status, hypotension, respiratory distress, and evidence of plasma leakage or multi-organ dysfunction. Laboratory data obtained at the time of admission encompassed complete blood count, hematocrit, liver function tests (SGOT and SGPT), renal function tests (creatinine), inflammatory markers (CRP), coagulation parameters (PT, INR, D-dimer, FDP), cardiac biomarkers (troponin-I), and serum bicarbonate. All laboratory parameters were interpreted in reference to standard institutional reference ranges, and patients exceeding critical thresholds were recorded. Additionally, the occurrence of severe complications, including dengue shock syndrome, acute kidney injury, acute liver failure, encephalopathy, myocarditis, disseminated intravascular coagulation, acute respiratory distress syndrome, and terminal events, was documented. For comparative analysis, fatalities were classified as early if death occurred within 48 hours of hospital admission and late if death occurred after 48 hours. Data extraction was performed independently by two investigators to ensure accuracy and completeness, with any discrepancies resolved through discussion.Data extraction was performed independently by two investigators to ensure accuracy and completeness, with discrepancies resolved through discussion.

Statistical Analysis

Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Continuous variables were tested for normality using the Shapiro–Wilk test. Normally distributed data are presented as mean ± standard deviation (SD), and non-normally distributed data as median with interquartile range (IQR). Categorical variables are summarized as frequencies and percentages. Comparisons between early and late fatalities were performed using Chi-square or Fisher's exact tests for categorical variables and Mann–Whitney U tests for continuous variables. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the strength of associations. A p-value <0.05 was considered statistically significant.

III. RESULT

The age of the patients ranged from 12 to 75 years, with a mean of 32.8±17.4 years (Table 1). Most deaths occurred in adults aged 18–40 years (42.31%), followed by 41–69 years (26.92%) and <18 years (23.08%). Only 7.69% of cases were ≥70 years. Female patients accounted for 57.69% of deaths, compared to 42.31% in males. The median day of illness at hospital admission was 4 days (IQR=3–5), indicating relatively late

presentation. Comorbidities were present in a minority: diabetes mellitus and hypertension in 11.54% each, and chronic liver disease in 7.69%. Shock on admission was noted in 57.69%, and 76.92% required ICU support. The median hospital stay prior to death was 3 days (IQR=2–5). Table 2 shows that fever in all patients. Severe weakness or myalgia occurred in 73.08%, vomiting in 65.38%, and abdominal pain in 53.85%. Mucosal bleeding was seen in 42.31%, gastrointestinal bleeding in 23.08%, hepatomegaly in 38.46%, and altered mental status in 30.77%. Hypotension occurred in 65.38%, shock in 57.69%, respiratory distress in 46.15%, and pleural effusion or ascites in 57.69%. Multi-organ dysfunction (MODS) developed in 50.00%. Thrombocytopenia was prominent, with median platelet count $27\times10^3/\mu L$ (IQR=16–39); 42.31% had counts $<50\times10^3/\mu L$ (Table 3). Hemoconcentration was observed in 30.77%, leukocytosis in 23.08%. Hepatic involvement included median SGOT 256 U/L (IQR=145–720) and SGPT 165 U/L (IQR=90–510), with elevations in 30.77% and 23.08%, respectively. Renal impairment was noted in 38.46%. CRP and troponin-I were elevated in 46.15% and 61.54%, respectively. Coagulopathy was universal, with prolonged PT in 57.69% and INR elevation in 26.92%. Metabolic acidosis exceeded critical limits in 30.77%. Table 4 reports that dengue Shock Syndrome in 69.23%, severe plasma leakage in 65.38%, acute kidney injury in 38.46%, acute liver failure in 23.08%, encephalopathy in 26.92%, myocarditis in 19.23%, DIC in 34.62%, ARDS in 23.08%, and cardiac arrest in 88.46%. Early (≤48 hours) versus late (>48 hours) fatalities showed shock on admission was more frequent in early deaths (83.33% vs. 35.71%; OR 9.00; p=0.01) (Table 5). Other parameters were more common in early fatalities but not statistically significant: platelet <20,000/μL (58.33% vs. 28.57%), hematocrit >50% (50.00% vs. 14.29%), lactate ≥5 mmol/L (66.67% vs. 28.57%), INR ≥2.0 (41.67% vs. 14.29%), and ≥2 organ failures (83.33% vs. 50.00%).

Table 1: Demographic and admission characteristics of fatal dengue cases (N = 26)

Variable	Frequency (n)	Percentage (%)
Age (Years)		
<18 years	6	23.08
18–40 years	11	42.31
41–69 years	7	26.92
≥70 years	2	7.69
Mean age ± SD	32.8 ± 17.4	
Gender		
Male	11	42.31
Female	15	57.69
Day of illness at admission	4	15.38
Median (IQR)	4 (3–5)	
Comorbidity		
Diabetes mellitus	3	11.54
Hypertension	3	11.54
Chronic liver disease	2	7.69
Shock on admission	15	57.69
ICU admission required	20	76.92
Duration of hospital stay before death (days)		
Median (IQR)	3 (2–5)	

Table 2: Clinical features at presentation among fatal dengue cases

Clinical Feature	Frequency (n)	Percentage (%)
Fever	26	100.00
Severe weakness / myalgia	19	73.08
Vomiting	17	65.38
Abdominal pain	14	53.85
Mucosal bleeding	11	42.31
Gastrointestinal bleeding	6	23.08
Hepatomegaly	10	38.46
Altered mental status	8	30.77
Hypotension (SBP <90 mmHg)	17	65.38
Respiratory distress	12	46.15
Pleural effusion / Ascites	15	57.69
Multi-organ dysfunction (MODS)	13	50.00
Shock on admission	15	57.69

Table 3: Laboratory profile of fatal dengue cases at admission

Parameter	Median (IQR)	No. of Patients Exceeding Critical Threshold (%)	Reference Range
Platelet count ($\times10^3/\mu L$)	27 (16–39)	11 (42.31)	150–450
Hematocrit (%)	47 (43–51)	8 (30.77)	40–50
WBC count ($\times10^3/\mu L$)	6.8 (4.5–10.9)	6 (23.08)	4–10
SGOT (U/L)	256 (145–720)	8 (30.77)	5–40
SGPT (U/L)	165 (90–510)	6 (23.08)	5–40

Creatinine (µmol/L)	160 (110–270)	10 (38.46)	45–110
CRP (mg/L)	60 (35–85)	12 (46.15)	<10
Troponin-I (ng/mL)	5.5 (0.7–36.4)	16 (61.54)	<0.1
D-dimer (ng/mL)	2,100 (1,500–2,626)	26 (100.00)	<500
FDP (ng/dL)	1,200 (800–1,600)	26 (100.00)	<500
PT (seconds)	21.4 (17.1–29.9)	15 (57.69)	11–14
INR	1.7 (1.4–2.1)	7 (26.92)	0.9–1.2
Serum bicarbonate (mmol/L)	15.5 (13.2–18.6)	8 (30.77)	22–28

Table 4: Severe complications among fatal dengue cases

Complication	Frequency (n)	Percentage (%)
Dengue Shock Syndrome (DSS)	18	69.23
Severe plasma leakage	17	65.38
Acute kidney injury (AKI)	10	38.46
Acute liver failure	6	23.08
Encephalopathy	7	26.92
Myocarditis	5	19.23
Disseminated intravascular coagulation (DIC)	9	34.62
Acute respiratory distress syndrome (ARDS)	6	23.08
Cardiac arrest (terminal event)	23	88.46

Table 5: Early (≤48h) vs late (>48h) fatality analysis among fthe study population

Variable	Early Death (n = 12)	Late Death (n = 14)	OR (95% CI)	p-value
Shock at admission	10 (83.33)	5 (35.7)	9.00 (1.46–55.5)	0.01
Platelet <20,000/µL	7 (58.33)	4 (28.57)	3.50 (0.74–16.6)	0.1
Hematocrit >50%	6 (50.00)	2 (14.29)	6.00 (0.98–36.4)	0.05
Lactate ≥5 mmol/L	8 (66.67)	4 (28.57)	4.80 (0.96–23.8)	0.06
INR ≥2.0	5 (41.67)	2 (14.29)	4.33 (0.69–27.0)	0.11
≥2 organ failures	10 (83.33)	7 (50.00)	5.00 (0.80–31.3)	0.09

IV. DISCUSSION

Understanding the clinical and laboratory characteristics of fatal dengue cases is essential for identifying high-risk patients and improving management strategies [15]. The patients' ages ranged from 12–75 years (mean 32.8 ± 17.4). Most deaths occurred in adults 18–40 years (42.3%), followed by 41–69 years (26.9%), <18 years (23.1%), and ≥70 years (7.7%). Females accounted for 57.7% of deaths. Median time from symptom onset to hospital admission was 4 days (IQR 3–5). Comorbidities included diabetes and hypertension (11.5% each) and chronic liver disease (7.7%). Shock on admission was present in 57.7%, 76.9% required ICU support, and the median hospital stay before death was 3 days (IQR 2–5). Asaduzzaman et al. reported that the risk of death increased with age, with each additional decade associated with ~30% higher case fatality. They also noted that women comprised 57% of deaths, closely mirroring our findings (57.7%) [16]. Hasan et al. reported that 60% of deaths were male, and 56% were under 30 years of age [17]. In another study, Karunakaran et al. reported that over 70% of deaths occurred in patients >40 years (OR 9.3) and observed higher mortality among females [18]. Yang et al. stated that non-demographic factors such as plasma leakage, dyspnea, and platelet count are stronger predictors of severe dengue than age or comorbidities alone [19]. Akter et al. reported a median duration from symptom onset to death of 5 days and from hospitalization to death of 2 days, with many patients dying within the first 72 hours of admission, similar to our observations of a median hospital stay of 3 days (IQR 2–5) before death [20]. Ruwanpathirana et al. reported a mean age of 40.2 years among fatal dengue cases, with leading causes of death including shock, acute liver failure, intracranial bleeding, and multiorgan dysfunction [6]. In this study, all patients had fever, with severe weakness/myalgia (73.1%), vomiting (65.4%), abdominal pain (53.8%), mucosal bleeding (42.3%), gastrointestinal bleeding (23.1%), hepatomegaly (38.5%), altered mental status (30.8%), hypotension (65.4%), shock (57.7%), respiratory distress (46.2%), pleural effusion/ascites (57.7%), and multi-organ dysfunction in 50.0%. Similarly, Deshwal et al. reported fever in 100% of cases, underscoring its universality as a presenting symptom [2]. Riaz et al. reported that the most common clinical manifestations of dengue virus infection were fever (99.6%), headache (89.1%), chills and rigors (86.5%), and myalgia (72.3%). Less frequent symptoms included vomiting (52.5%), arthralgia (50.2%), and skin rashes (47.5%). Severe presentations among DHF patients included nasal bleeding (44.1%), gum bleeding (32.6%), pleural effusion (13.9%), and hematuria (13.1%) [21]. Laboratory abnormalities included thrombocytopenia (42.3%), hemoconcentration (30.8%), leukocytosis (23.1%), hepatic enzyme elevation (SGOT 30.8%, SGPT 23.1%), renal impairment (38.5%), elevated CRP (46.2%) and troponin-I (61.5%), coagulopathy (PT 57.7%, INR 26.9%), and metabolic acidosis (30.8%). Singh et al. reported significantly lower platelet counts among non-survivors compared to survivors (mean 26,375/µL vs 108,996/µL, $p < 0.001$), emphasizing thrombocytopenia as a key risk factor for mortality [22]. Elevated liver enzymes, renal impairment, and coagulopathy have also been consistently

associated with fatal outcomes in dengue [15]. Dengue fatalities presented with shock (69.2%), severe plasma leakage (65.4%), AKI (38.5%), acute liver failure (23.1%), encephalopathy (26.9%), myocarditis (19.2%), DIC (34.6%), ARDS (23.1%), and cardiac arrest (88.5%). Wongtrakul et al. reported that while acute liver failure (ALF) occurs in only 2% of general dengue cases, its risk rises markedly in severe dengue and DSS, with pooled mortality reaching 47% [23]. Riaz et al. reported that dengue-induced vascular leakage can affect multiple organs including liver, lung, and kidney, leading to multi-organ dysfunction (MOD), which is strongly associated with mortality [21]. Early deaths (≤48 h) had more shock (83.3% vs. 35.7%; OR 9.0, $p = 0.01$) and higher rates of severe parameters including platelets <20,000/μL, hematocrit >50%, lactate ≥5 mmol/L, INR ≥2.0, and ≥2 organ failures. Nandwani et al. found that in children with severe dengue, an initial platelet count ≤ 20,000/mm³ was strongly associated with mortality (OR=5.5), emphasizing the prognostic importance of early hematological markers [24]. Acharya et al. identified that, in adults, independent predictors of death included platelet counts <20,000/mm³, prolonged prothrombin time, renal failure, encephalopathy, and multi-organ dysfunction [25].

Limitations of the study: This study has several limitations. Being a single-center, retrospective analysis, it is subject to selection and information biases due to incomplete or inconsistent medical records. The small sample size of 26 fatal cases limits the generalizability of findings to broader populations. Lack of standardized timing for laboratory assessments and interventions may have influenced results. Additionally, potential confounding factors, such as variations in prior comorbidities, treatment protocols, and access to care, could not be fully controlled, restricting causal inferences.

V. CONCLUSION

This study highlights the critical clinical and laboratory features associated with fatal dengue infections in a tertiary care setting. Fatalities predominantly occurred in young to middle-aged adults, with a slightly higher prevalence in females. Shock at presentation, multi-organ dysfunction, severe thrombocytopenia, coagulopathy, elevated hepatic and renal markers, and metabolic acidosis were frequent and strongly associated with early death. Dengue shock syndrome, severe plasma leakage, and cardiac arrest were the most common terminal events. Early recognition of these high-risk features, timely ICU admission, and meticulous supportive care are essential to reduce mortality. These findings reinforce the need for heightened clinical vigilance and optimized management strategies in severe dengue cases.

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