

Dengue Fever: Clinical and Hematological Features Correlated with Disease Severity and Treatment Outcome

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Abstract:

Background: Dengue is an important mosquito-borne viral infection with a spectrum ranging from uncomplicated dengue fever to dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS). Clinical and hematological abnormalities are useful for assessment of disease severity and prognosis.

Objectives: To study the clinical and hematological profile of dengue fever and to correlate disease severity with clinical findings, hematological abnormalities, treatment and outcome.

Methods: This prospective observational study included 100 serologically proven dengue patients aged more than 18 years admitted to the Department of General Medicine, BRIMS Bidar, between August 2023 and September 2024. Patients were evaluated clinically and with serial hematological investigations. Dengue cases were classified as dengue fever, DHF or DSS according to the study criteria/WHO criteria. Platelet count, hematocrit, leukocyte count, coagulation profile, serology, ultrasonography and treatment were documented.

Results: Of 100 patients, 68% had dengue fever, 22% DHF and 10% DSS. Forty-five percent were aged 26–50 years and 60% were male. Fever (98%), myalgia (88%), headache (52%), arthralgia (40%) and rash (34%) were common presentations. Thrombocytopenia occurred in 78% of patients, leukopenia in 26%, and hemoconcentration in 26%. Coagulation abnormalities were identified in 12 of 32 patients in whom coagulation testing was performed, with abnormalities more frequent and severe in DSS. Blood components were transfused in 22% of patients. Overall, 94% improved and were discharged, 2% left against medical advice, and 4% died; all deaths occurred in patients with DSS.

Conclusion: Thrombocytopenia, hemoconcentration, leukocyte abnormalities, bleeding manifestations and coagulation derangement are important laboratory and clinical findings in dengue. Disease severity, particularly DSS, was strongly associated with poor outcome. Early recognition and appropriate supportive management may reduce morbidity and mortality.

Keywords: Dengue Fever; Dengue Haemorrhagic Fever; Dengue Shock Syndrome; Thrombocytopenia; Leukopenia; Hematocrit; Coagulation; Treatment Outcome.

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Introduction

Dengue is an acute febrile viral infection transmitted predominantly by *Aedes* mosquitoes and may present as an uncomplicated febrile illness or progress to severe disease with plasma leakage, hemorrhage, shock and organ dysfunction. The clinical spectrum includes dengue fever, DHF and DSS, and the severity of illness can evolve over a short period. [1] Hematological abnormalities are characteristic of dengue. Thrombocytopenia, leukopenia and hemoconcentration are frequently observed, while coagulation abnormalities may accompany severe disease. These parameters, together with clinical evidence of bleeding and plasma leakage, can assist in risk stratification and monitoring.[2] The present study was undertaken to

characterize the clinical and hematological profile of hospitalized dengue patients and to assess the relationship between disease severity, laboratory abnormalities, treatment requirements and outcome.

Aim and Objectives

- To study the clinical profile of dengue fever.
- To study the hematological profile of patients with dengue fever.
- To correlate the initial severity of dengue with clinical and hematological findings and treatment outcome.

Materials and Methods

Study design and setting: This was a prospective observational study conducted among inpatients in the Department of General Medicine, BRIMS Bidar, and Karnataka. The study period was August 2023 to September 2024. A total of 100 patients were included. The source dissertation reports that the calculated sample size was 96 or more and that 100 cases were ultimately studied.

Participants: Serologically proven dengue cases aged more than 18 years were eligible. Patients with alcoholic liver disease, drug-induced thrombocytopenia, or coinfections known to cause thrombocytopenia (including enteric fever, sepsis, leptospirosis, HIV and malaria) were excluded.

Clinical Assessment: Detailed history, demographic data, symptom duration, atypical symptoms and comorbid illnesses were recorded. Vital signs and evidence of plasma leakage, bleeding, and respiratory, cardiovascular, neurological and abdominal abnormalities were documented.

Laboratory Assessment: Investigations included complete blood count, differential count, serial platelet counts and hematocrit, liver function tests, coagulation profile when indicated, renal function tests and dengue serology. Imaging included chest radiography, ECG and abdominal ultrasonography where clinically indicated. The study proforma

specifically recorded total leukocyte count, platelet count, hematocrit, bilirubin, SGOT/SGPT, prothrombin time, INR, aPTT, urea, creatinine and dengue serology.

Disease classification and treatment: Patients were categorized as dengue fever, DHF or DSS according to the study's WHO-based classification. Management was supportive and included analgesic/paracetamol therapy, intravenous fluids and blood component therapy when clinically indicated. Platelet transfusion, fresh frozen plasma (FFP) and whole blood were recorded.

Statistical Approach: The dissertation presents descriptive frequencies and percentages and comparisons of clinical/hematological findings across dengue severity categories. No independent inferential statistical analysis beyond the reported study tables was available in the source; therefore, this manuscript retains the source-reported descriptive results and avoids adding unreported statistical tests.

Results

Clinical spectrum and demographics: Among 100 serologically positive patients, 68 (68%) had dengue fever, 22 (22%) had DHF and 10 (10%) had DSS. The largest age group was 26–50 years (45%), followed by 18–25 years (43%); 12% were older than 50 years. Sixty patients were male and 40 were female (male: female ratio 3:2).

Table 1:

Variable	Dengue fever (n=68)	DHF (n=22)	DSS (n=10)	Total (n=100)
Age 18–25 years	33 (48.5%)	8 (36.4%)	2 (20%)	43 (43%)
Age 26–50 years	31 (45.6%)	9 (40.9%)	5 (50%)	45 (45%)
Age >50 years	4 (5.9%)	5 (22.7%)	3 (30%)	12 (12%)
Male	39 (57.3%)	14 (63.6%)	7 (70%)	60 (60%)
Female	29 (42.7%)	8 (36.4%)	3 (30%)	40 (40%)

Seasonality: Cases occurred throughout the year, with a marked rise from June and a peak in August–September.

Monthly case counts were: August 20, September 26, October 14, November 9 and December 5. January 2, February 1, March 2, April 1, May 3, June 6, July 11,

Clinical manifestations: Fever was reported in 98% of patients, followed by myalgia (88%), headache (52%), arthralgia (40%), rash (34%), nausea/vomiting (24%), abdominal pain (22%), retro-orbital pain (16%) and diarrhea (6%). Signs included bradycardia (48%), hypotension (42%), ascites (38%), pleural effusion (38%), tachycardia (28%), hepatomegaly (20%) and splenomegaly (18%).

Table 2:

Clinical feature	n (%)
Fever	98 (98%)
Myalgia	88 (88%)
Headache	52 (52%)
Arthralgia	40 (40%)
Rash	34 (34%)
Nausea/vomiting	24 (24%)
Abdominal pain	22 (22%)

Retro-orbital pain	16 (16%)
Diarrhea	6 (6%)
Bradycardia	48 (48%)
Hypotension	42 (42%)
Ascites	38 (38%)
Pleural effusion	38 (38%)
Hepatomegaly	20 (20%)
Splenomegaly	18 (18%)

Bleeding manifestations were documented in 40 patients. Rash was the most frequent manifestation, followed by melena and petechiae. The source data show an inverse relationship between platelet count and bleeding manifestations, with melena, petechiae and hematuria occurring more often at lower platelet counts.

Table 3:

Bleeding manifestation	n (%)
Rash	34 (85%)
Melena	14 (35%)
Petechiae	14 (35%)
Ecchymosis	6 (15%)
Purpura	4 (10%)
Gum bleeding	4 (10%)
Hematuria	3 (7.5%)

Atypical manifestations: Cardiac findings included bradycardia (48), cardiac failure (8), myocarditis (6), ventricular ectopics (4) and arrhythmia (2). Neurological manifestations included cerebral anoxia/edema (4), seizures (3), encephalopathy (1), cerebral hemorrhage (1) and infarction (1).

Gastrointestinal involvement included hepatitis in 48 patients, hepatomegaly in 20 and acute pancreatitis in 1. Acute kidney injury occurred in 4 patients and ARDS in 2. Serology: Dengue serology was positive for NS1 antigen in 48

patients, IgM in 46 and IgG in 6 patients. Hematological findings: On admission, hemoconcentration (hematocrit >45%) was present in 26 patients and improved after fluid resuscitation. Thrombocytopenia was present in 78 patients. Leukopenia occurred in 26 patients and leukocytosis in 8; 22 patients had neutropenia with relative lymphocytosis on admission.

Among 96 discharged patients, 94 had platelet counts above 100,000/mm³ at discharge.

Table3:

Platelet count (cells/mm ³)	Day 0 (n=100)	Day 1 (n=96)	Discharge (n=96)
<20,000	9	7	0
20,000–50,000	11	5	0
50,000–100,000	33	30	2
100,000–150,000	25	28	36
>150,000	22	30	58

Table 4:

Hematocrit	Day 0 (n=100)	Day 1 (n=96)	Discharge (n=96)
<35%	12	8	4
35–45%	62	74	88
>45%	26	18	4

Table 5:

Total leukocyte count (cells/mm ³)	Admission (n=100)	Discharge (n=96)
<4,000	26	2
4,000–11,000	76	94
>11,000	8	0

Coagulation profile: Coagulation testing was performed in 32 patients (22 DHF and 10 DSS). Twelve patients had deranged values. In DHF, 4 patients had prolonged prothrombin time, aPTT and INR; in DSS, 8 patients had abnormalities in each of these parameters. Coagulation abnormalities were therefore more frequent and severe in DSS.

Table 6:

Severity	PT ≤15 s	PT >15 s	aPTT ≤40 s	aPTT >40 s	INR ≤1.5	INR >1.5
DHF (n=22)	18	4	18	4	18	4
DSS (n=10)	2	8	2	8	2	8

Ultrasonography: Gall-bladder wall edema was reported in 48 patients, polyserositis in 38, and hepatomegaly in 20, and splenomegaly in 18 and acalculous cholecystitis in 4.

Treatment and outcome: All patients received symptomatic treatment. Platelet transfusion was

given to 22 patients, FFP to 12 and whole blood to 2. Among the 68 classical dengue cases, all recovered. All 22 DHF patients recovered.

Of the 10 DSS patients, 6 recovered and 4 died. Overall, 94 patients improved and were discharged, 2 left against medical advice and 4 died.

Table 7:

Clinical spectrum	Symptomatic	Platelet transfusion	FFP	Whole blood	Improved/discharged	Death
Dengue fever (n=68)	68	0	0	0	68	0
DHF (n=22)	22	13	4	0	22	0
DSS (n=10)	10	9	8	2	6	4
Total (n=100)	100	22	12	2	96	4

Discussion

This prospective observational study of 100 hospitalized serologically proven dengue patients demonstrated a broad clinical spectrum, with 68% classified as dengue fever, 22% as DHF and 10% as DSS. The distribution and clinical profile are consistent with the study's stated objective of correlating severity with hematological findings and outcome.

Fever was nearly universal, while myalgia, headache and arthralgia were frequent constitutional symptoms. Plasma-leakage manifestations such as ascites and pleural effusion were prominent, particularly in severe disease. Hepatomegaly, splenomegaly and atypical hepatic, cardiac, neurological and renal manifestations were also observed.

Thrombocytopenia was the most frequent hematological abnormality, occurring in 78% of patients. The platelet count generally recovered by discharge, with 94 of 96 discharged patients having counts above 100,000/mm³. Hemoconcentration occurred in 26% and improved following fluid resuscitation, supporting the importance of serial hematocrit monitoring in patients at risk of plasma leakage.

Leukopenia was present in 26% and was accompanied in some patients by relative neutropenia and lymphocytosis. The source data show substantial normalization of leukocyte counts by discharge. Coagulation abnormalities were concentrated in DHF and DSS and were markedly more frequent in DSS, indicating progressive hemostatic disturbance with increasing clinical severity.

Treatment was predominantly supportive. Blood components were used mainly in severe disease.

All four deaths occurred in DSS, and the overall mortality was 4%. The study therefore supports the clinical importance of early identification of hypotension, plasma leakage, bleeding, thrombocytopenia, and hemoconcentration and coagulation abnormalities for timely escalation of supportive care.

These findings are broadly comparable with prior studies cited in the source dissertation, which have reported thrombocytopenia, leukopenia, and hemoconcentration and raised transaminases as common laboratory abnormalities and severe plasma leakage/shock as important predictors of mortality.⁴⁻⁸

Conclusion

Dengue fever is associated with important clinical and hematological abnormalities that vary with disease severity. Thrombocytopenia was the commonest hematological abnormality, while hemoconcentration and coagulation abnormalities were important markers of severe disease. DSS was associated with substantially poorer outcome and accounted for all deaths in this cohort. Close clinical observation and serial hematological assessment, with timely supportive management and blood component therapy when indicated, are important for reducing complications and mortality.

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