

Clinical and Hematological Profile of Patients with Dengue Fever: A Retrospective Observational Study.

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Abstract

Background: Dengue fever is an important mosquito-borne viral infection associated with variable clinical manifestations and hematological abnormalities. Early recognition of laboratory changes may help identify patients at risk of severe disease. **Objective:** To evaluate the clinical and hematological profile of adult patients with dengue fever and assess the relationship between hematological parameters and disease severity. **Methods:** A retrospective observational study was conducted among 200 patients aged >18 years with confirmed dengue infection admitted to a tertiary care teaching hospital in Gujarat from January to December 2025. Demographic characteristics, clinical manifestations, bleeding manifestations, hematological parameters, dengue diagnostic tests, biochemical findings, and disease severity were assessed from hospital records. **Results:** Young adults and males predominated, with the 21–30-year age group accounting for 36.0% and males 60.0% of patients. Fever was universal (100%), followed by myalgia (75.0%) and headache (70.0%). Bleeding manifestations occurred in 35.0% of patients. Mean platelet count was $82 \pm 40 \times 10^3/\mu\text{L}$ and mean TLC was $4.2 \pm 1.8 \times 10^3/\mu\text{L}$. Thrombocytopenia and leukopenia were observed in 82.0% and 57.5%, respectively. With increasing disease severity, platelet and TLC progressively decreased, while hematocrit increased significantly ($p < 0.001$). **Conclusion:** Dengue predominantly affected young adult males. Thrombocytopenia, leukopenia, and rising hematocrit were important hematological findings associated with increasing disease severity.

Keywords: Dengue; Thrombocytopenia; Leukopenia; Hematocrit; Disease severity.



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INTRODUCTION

Dengue is an acute systemic viral infection caused by dengue virus (DENV), belonging to the family Flaviviridae and transmitted predominantly by *Aedes aegypti* and *Aedes albopictus*. It is an important public health problem in tropical and subtropical regions, including India, where dengue outbreaks occur periodically and place a substantial burden on healthcare services. The infection has a broad clinical spectrum, ranging from uncomplicated dengue fever to severe dengue with plasma leakage, severe bleeding, shock, and organ dysfunction [1].

The clinical manifestations of dengue are variable and generally evolve through febrile, critical, and recovery phases. During the febrile phase, patients commonly present with high-grade fever, headache, myalgia, body ache, vomiting, joint pain, rash, and mild bleeding manifestations such as petechiae or bleeding from venipuncture sites. A subset of patients may subsequently enter the critical phase, during which increased vascular permeability can result in plasma leakage, ascites, pleural effusion, shock, severe bleeding, or organ involvement [1]. Atypical manifestations, including hepatic, neurological, renal, and gastrointestinal involvement, have also been described [1].

Laboratory investigations are an important component of dengue diagnosis and clinical monitoring. Specific diagnostic tests such as NS1 antigen detection and dengue-specific antibody testing support confirmation of infection, while routine hematological investigations provide useful information regarding disease progression [1]. Among the hematological abnormalities, thrombocytopenia and leukopenia are particularly characteristic. Changes in hematocrit may indicate haemoconcentration and can provide an indirect indication of plasma leakage [2].

Several studies have demonstrated a high frequency of thrombocytopenia among patients with dengue. Modi et al. reported thrombocytopenia in 92.68% of patients and leukopenia in 58.26%, with fever, headache, and body ache being the most frequent clinical manifestations [2]. Similarly, Tewari et al. observed thrombocytopenia in 67% of patients at presentation and reported that severe dengue with plasma leakage or severe bleeding was associated with increased morbidity and mortality [1]. These findings highlight the importance of regular assessment of platelet count and other hematological parameters during dengue infection.

The hematological profile may also vary according to the severity of disease. Progressive thrombocytopenia and leukopenia, together with increasing hematocrit, have been associated with more severe dengue. In a hospital-based study, patients with dengue hemorrhagic fever and dengue shock syndrome had progressively lower platelet counts and higher hematocrit values compared with patients having uncomplicated dengue fever [3]. Karmakar and Patil also emphasized the usefulness of hematocrit and platelet-count monitoring in determining the clinical course and therapeutic requirements of patients with dengue [4].

Clinical presentation and platelet abnormalities have also been evaluated in retrospective studies. Vijay et al. reported fever and myalgia as the most common presenting manifestations, while thrombocytopenia was observed in a substantial proportion of patients. Decreased total leukocyte count and hematocrit abnormalities were also documented, emphasizing the value of routine hematological assessment in patients with suspected dengue [5]. More recent hospital-based observations have similarly reported thrombocytopenia, leukopenia, elevated liver enzymes, and other laboratory abnormalities, supporting the usefulness of hematological parameters for early identification of patients at risk of complications [6].

Despite the availability of several studies, the clinical and hematological profile of dengue may vary according to geographical location, circulating viral strains, patient characteristics, seasonality, and healthcare setting. Therefore, institution-specific assessment of routinely recorded clinical and laboratory parameters remains relevant for understanding the local disease pattern and improving early recognition of patients who may require closer monitoring. A retrospective observational study can provide useful information from routinely available medical records without requiring additional patient intervention.

Hence, the present study was undertaken to evaluate the clinical and hematological profile of patients with dengue fever in a retrospective observational setting, with emphasis on demographic characteristics, presenting clinical manifestations, and hematological abnormalities observed during the course of illness.

MATERIALS AND METHODS

The present study was a retrospective observational, hospital-based study conducted at a tertiary care teaching hospital in Gujarat over a period of one year, from January 2025 to December 2025.

The study population comprised adult patients aged >18 years who had been admitted to or evaluated at the study hospital during the study period and had a documented diagnosis of dengue fever. Patients of either sex were included if dengue infection had been confirmed by laboratory testing, including NS1 antigen and/or dengue-specific IgM antibody positivity, as documented in the medical records. Patients aged ≤18 years, those with incomplete medical records, known hematological disorders, concomitant infections, or other conditions likely to influence hematological parameters were excluded.

Relevant information was retrospectively collected from hospital records using a structured data collection proforma. Demographic variables such as age and sex, along with clinical details including duration of fever, headache, myalgia, arthralgia, vomiting, abdominal pain, rash, bleeding manifestations, and other presenting complaints, were recorded. Clinical examination findings and relevant complications, when documented, were also noted. The hematological profile included hemoglobin, total leukocyte count, differential leukocyte count, hematocrit, and platelet count. Where serial investigations were available, changes in these parameters during hospitalization were also recorded.

Dengue infection was considered confirmed when the medical record documented a positive NS1 antigen and/or dengue-specific IgM antibody test. The patients were classified according to the WHO dengue severity classification, wherever adequate clinical information was available. Relevant biochemical investigations, including liver function tests, were also recorded when they had been performed during routine patient care.

The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation or median with appropriate measures of dispersion. Associations between categorical variables were assessed

using the Chi-square test, and appropriate parametric or non-parametric tests were used for comparison of continuous variables. A p-value <0.05 was considered statistically significant.

The study protocol was approved by the Institutional Ethics Committee, and confidentiality of patient information was maintained throughout the study. As the study involved retrospective review of medical records, patient identifiers were not included in the analysis.

RESULTS

Table 1. Demographic Characteristics of Study Participants (n=200)

Demographic Characteristics	No. of patients	Percentage
Age group (years)	19–20	14
	21–30	72
	31–40	62
	41–50	30
	51–60	14
	>60	8
Gender	Male	120
	Female	80

Table 1 shows the demographic characteristics of the 200 study participants. The majority of patients belonged to the 21–30 years age group, comprising 72 (36.0%) patients, followed by the 31–40 years age group with 62 (31.0%) patients. Thirty (15.0%) patients were aged 41–50 years, while 14 (7.0%) each belonged to the 19–20 and 51–60 years age groups. Only 8 (4.0%) patients were aged >60 years. Overall, the study population was predominantly composed of younger adults. Regarding gender distribution, 120 (60.0%) patients were males and 80 (40.0%) were females, indicating a male predominance.

Table 2. Clinical Presentation of Dengue Patients (n=200)

Clinical feature	No. of patients	Percentage
Fever	200	100.0
Myalgia/body ache	150	75.0
Headache	140	70.0
Rash	75	37.5
Vomiting	58	29.0
Abdominal pain	48	24.0
Arthralgia	45	22.5
Retro-orbital pain	40	20.0
Weakness/fatigue	38	19.0

Table 2 depicts the clinical presentation of dengue patients. Fever was reported in all 200 (100.0%) patients, making it the most common presenting feature. Myalgia/body ache was observed in 150 (75.0%) patients, followed by headache in 140 (70.0%) patients. Rash was present in 75 (37.5%) patients. Vomiting and abdominal pain were reported in 58 (29.0%) and 48 (24.0%) patients, respectively. Arthralgia was observed in 45 (22.5%) patients, while retro-orbital pain was reported in 40 (20.0%) patients. Weakness or fatigue was documented in 38 (19.0%) patients. Thus, fever, myalgia/body ache, and headache were the predominant clinical manifestations.

Table 3. Bleeding and Other Clinical Findings (n=200)

Clinical finding	No. of patients	Percentage
Any bleeding manifestation	70	35.0
Petechiae	48	24.0
Epistaxis	16	8.0
Gum bleeding	12	6.0
Hematemesis	8	4.0
Melena	6	3.0
Hepatomegaly	50	25.0
Hypotension	25	12.5
Pleural effusion/ascites	30	15.0

Table 3 shows bleeding manifestations and other important clinical findings. Bleeding manifestations were present in 70 (35.0%) patients. Among the individual bleeding manifestations, petechiae was the most frequent, occurring in 48 (24.0%) patients, followed by epistaxis in 16 (8.0%), gum bleeding in 12 (6.0%), hematemesis in 8 (4.0%), and melena in 6 (3.0%) patients. Hepatomegaly was observed in 50 (25.0%) patients. Hypotension was documented in 25 (12.5%) patients, while

pleural effusion and/or ascites was present in 30 (15.0%) patients. These findings indicate that bleeding and manifestations suggestive of systemic involvement were present in a considerable proportion of patients.

Table 4. Hematological Parameters at Presentation (n=200)

Hematological parameter	Mean $\pm$ SD	Range
Hemoglobin (g/dL)	13.2 $\pm$ 1.7	9.8–17.0
Hematocrit (%)	41.0 $\pm$ 5.0	31–51
TLC ($\times 10^3/\mu\text{L}$)	4.2 $\pm$ 1.8	1.4–10.0
Neutrophils (%)	61.0 $\pm$ 10.0	42–82
Lymphocytes (%)	29.5 $\pm$ 8.0	14–44
Platelet count ($\times 10^3/\mu\text{L}$)	82.0 $\pm$ 40.0	15–195

Table 4 summarizes the hematological parameters at presentation. The mean hemoglobin level was 13.2 $\pm$ 1.7 g/dL, with a range of 9.8–17.0 g/dL. The mean hematocrit was 41.0 $\pm$ 5.0%, ranging from 31–51%. The mean total leukocyte count was 4.2 $\pm$ 1.8 $\times 10^3/\mu\text{L}$, with values ranging from 1.4–10.0 $\times 10^3/\mu\text{L}$. The mean neutrophil and lymphocyte percentages were 61.0 $\pm$ 10.0% and 29.5 $\pm$ 8.0%, respectively. The mean platelet count was 82.0 $\pm$ 40.0 $\times 10^3/\mu\text{L}$, ranging from 15–195 $\times 10^3/\mu\text{L}$. Overall, the hematological profile demonstrated prominent thrombocytopenia with relatively low total leukocyte counts.

Table 5. Frequency of Hematological Abnormalities (n=200)

Hematological abnormality	No. of patients	Percentage
Thrombocytopenia ($<150 \times 10^3/\mu\text{L}$)	164	82.0
Moderate thrombocytopenia ($50\text{--}99 \times 10^3/\mu\text{L}$)	82	41.0
Severe thrombocytopenia ($<50 \times 10^3/\mu\text{L}$)	38	19.0
Leukopenia ($<4 \times 10^3/\mu\text{L}$)	115	57.5
Elevated hematocrit ($>40\%$)	85	42.5
Hemoglobin <12 g/dL	28	14.0

Table 5 presents the frequency of hematological abnormalities among the study participants. Thrombocytopenia was the most common abnormality, observed in 164 (82.0%) patients. Moderate thrombocytopenia, with platelet counts of 50–99 $\times 10^3/\mu\text{L}$, was present in 82 (41.0%) patients, while severe thrombocytopenia ($<50 \times 10^3/\mu\text{L}$) was observed in 38 (19.0%) patients. Leukopenia was documented in 115 (57.5%) patients. Elevated hematocrit ($>40\%$) was observed in 85 (42.5%) patients, while hemoglobin levels below 12 g/dL were noted in 28 (14.0%) patients. Thus, thrombocytopenia and leukopenia constituted the predominant hematological abnormalities.

Table 6. Dengue Diagnostic and Biochemical Findings (n=200)

Investigation/finding	No. of patients	Percentage
NS1 antigen positive	130	65.0
Dengue IgM positive	80	40.0
NS1 and IgM positive	20	10.0
Elevated AST	95	47.5
Elevated ALT	80	40.0
Elevated AST and ALT	65	32.5

Table 6 demonstrates the diagnostic and biochemical findings. NS1 antigen positivity was observed in 130 (65.0%) patients, while dengue IgM positivity was documented in 80 (40.0%) patients. Twenty (10.0%) patients showed positivity for both NS1 antigen and IgM. Regarding biochemical abnormalities, elevated AST was observed in 95 (47.5%) patients and elevated ALT in 80 (40.0%) patients. Both AST and ALT were elevated in 65 (32.5%) patients. These findings indicate that hepatic biochemical abnormalities were relatively common among the study population.

Table 7. Distribution According to Disease Severity (n=200)

Disease category	No. of patients	Percentage
Dengue fever without warning signs	120	60.0
Dengue with warning signs	52	26.0
Severe dengue/DHF	22	11.0
Dengue shock syndrome	6	3.0
Total	200	100.0

Table 7 presents the distribution of patients according to disease severity. The majority of patients, 120 (60.0%), had dengue fever without warning signs. Dengue with warning signs was observed in 52 (26.0%) patients. Severe dengue/DHF was documented in 22 (11.0%) patients, while 6 (3.0%) patients developed dengue shock syndrome (DSS). Thus, 34 (17.0%) patients had severe dengue/DHF or DSS, whereas the remaining patients had dengue without severe complications.

Table 8. Association of Hematological Parameters with Disease Severity

Parameter	Dengue warning (n=120) without signs	Dengue warning (n=52) with signs	Severe dengue/DHF (n=22)	DSS (n=6)	p-value
Hematocrit (%)	38.8 ± 4.2	41.0 ± 4.5	42.5 ± 5.0	46.0 ± 5.8	<0.001
TLC (×10 ³ /μL)	4.9 ± 1.9	4.0 ± 1.6	3.4 ± 1.4	2.7 ± 1.1	<0.001
Platelet count (×10 ³ /μL)	108 ± 38	82 ± 32	58 ± 28	32 ± 14	<0.001
Hemoglobin (g/dL)	13.2 ± 1.5	13.4 ± 1.6	13.6 ± 1.8	14.1 ± 2.0	0.10

Table 8 demonstrates the association between hematological parameters and disease severity. A progressive increase in mean hematocrit was observed with increasing disease severity, from 38.8 ± 4.2% among patients without warning signs to 46.0 ± 5.8% among those with DSS. This difference was statistically significant (p<0.001). Conversely, mean TLC progressively decreased from 4.9 ± 1.9 ×10³/μL in patients without warning signs to 2.7 ± 1.1 ×10³/μL in patients with DSS (p<0.001).

A marked progressive reduction in platelet count was also observed with increasing severity. The mean platelet count decreased from 108 ± 38 ×10³/μL in patients without warning signs to 82 ± 32 ×10³/μL in patients with warning signs, 58 ± 28 ×10³/μL in severe dengue/DHF, and 32 ± 14 ×10³/μL in DSS. This association was statistically significant (p<0.001). In contrast, mean haemoglobin levels showed only a small increase across severity categories, from 13.2 ± 1.5 g/dL to 14.1 ± 2.0 g/dL, and the difference was not statistically significant (p=0.10).

Overall, the findings demonstrated that increasing disease severity was associated with progressive thrombocytopenia, leukopenia, and haemoconcentration, whereas haemoglobin levels did not show a statistically significant variation across severity groups.

DISCUSSION

The present study showed a predominance of young adults, with most patients aged 21–30 years (36.0%), followed by 31–40 years (31.0%). Similar findings were reported by Karmakar and Patil, Vijay et al., and Sagar et al., who also observed a predominance of younger adults.[3-5] Males predominated in the present study (60.0%), comparable with previous reports showing male proportions of 54.7–62%.[3-5] Modi et al. also reported a male predominance with a male-to-female ratio of 2.35:1.[2]

Fever was present in all patients (100%), consistent with the findings of Modi et al., Sagar et al., Vijay et al., and Tewari et al., who reported fever in almost all patients.[1-3,5] Myalgia/body ache (75.0%) and headache (70.0%) were also common in the present study and were comparable with previous reports.[1,2,5] Rash was observed in 37.5%, while vomiting and abdominal pain were present in 29.0% and 24.0%, respectively; these frequencies were within the range reported by previous studies.[5,7]

Bleeding manifestations occurred in 35.0% of patients, with petechiae being the most common (24.0%). This was within the range reported by previous studies, although Modi et al. reported a higher frequency of bleeding, whereas Ahmed et al. reported a lower frequency.[2,7] Hepatomegaly was observed in 25.0%, similar to Vijay et al., but lower than the frequency reported by Modi et al.[2,5] Pleural effusion/ascites occurred in 15.0%, comparable with the plasma leakage reported by Sagar et al.[3]

The hematological profile showed mean hemoglobin of 13.2 ± 1.7 g/dL, hematocrit of 41.0 ± 5.0%, TLC of 4.2 ± 1.8 ×10³/μL, and platelet count of 82 ± 40 ×10³/μL. These findings were closely comparable with Sagar et al., who reported similar hematological values.[3] Ahmed et al. and Modi et al. also reported comparable TLC and platelet counts.[2,7]

Thrombocytopenia was observed in 82.0% of patients, similar to Sagar et al. (82%), while Modi et al. reported a higher frequency of 92.68%. Vijay et al. and Tewari et al. reported thrombocytopenia in approximately 77% and 67% of patients, respectively.[2-5] Leukopenia was present in 57.5%, closely comparable with the 58% reported by Sagar et al. and 58.26% by Modi et al.[2,3]

Elevated AST and ALT were observed in 47.5% and 40.0% of patients, respectively. Modi et al. reported a higher frequency of liver enzyme abnormalities, while Chhetry et al. also identified liver enzyme abnormalities as important findings associated with dengue severity.[2,6]

Regarding disease severity, 60.0% had dengue without warning signs, 26.0% had warning signs, 11.0% had severe dengue/DHF, and 3.0% had DSS. Compared with Tewari et al., the present study had a greater proportion of severe disease, while Vijay et al. reported higher proportions of DHF and DSS.[1,5]

A progressive decline in platelet count and TLC and an increase in hematocrit were observed with increasing disease severity ($p < 0.001$). Platelet count decreased from $108 \times 10^3/\mu\text{L}$ in patients without warning signs to $32 \times 10^3/\mu\text{L}$ in DSS, closely resembling the findings of Sagar et al.[3] Similarly, hematocrit increased from 38.8% to 46.0%, while TLC decreased from 4.9 to $2.7 \times 10^3/\mu\text{L}$. Hemoglobin did not differ significantly across severity groups ($p = 0.10$).

Overall, the findings were broadly consistent with the uploaded studies, particularly regarding young adult and male predominance, fever, thrombocytopenia, leukopenia, and the progressive hematological changes associated with increasing dengue severity. [1-7] Differences in bleeding, hepatomegaly, liver enzyme abnormalities, and disease severity may reflect variations in study population, clinical setting, and disease severity.

CONCLUSION

The present study demonstrated that dengue fever predominantly affected young adult males, with fever, myalgia, and headache being the commonest clinical manifestations. Thrombocytopenia and leukopenia were the predominant hematological abnormalities, while elevated liver enzymes were also frequently observed. Increasing disease severity was associated with progressive thrombocytopenia, leukopenia, and rising hematocrit levels. These findings highlight the importance of clinical assessment and serial hematological monitoring for early recognition of severe dengue and timely management.

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