Section: General Medicine

Original Research Article

CORRELATION BETWEEN THROMBOCYTOPENIA AND SEVERITY OF DENGUE FEVER IN ADMITTED PATIENTS IN A TERTIARY CARE HOSPITAL

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Received *: 10/02/2026*
Received in revised form *: 27/03/2026*
Accepted *: 14/04/2026*

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DOI: 10.70034/ijmedph.2026.2.192

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 1135-1141

ABSTRACT

Background: Dengue fever has emerged as a major global public health concern and is currently the most important vector-borne viral disease in tropical regions. **Objective:** to evaluate the correlation between thrombocytopenia and severity of dengue infection among hospitalized patients in a tertiary care centre.

Materials and Methods: This Hospital-based prospective observational study was conducted in the Department of General Medicine, including the medical and fever wards, at Bombay Hospital, Indore, Madhya Pradesh, India, a tertiary care teaching hospital.

Results: Abnormal vital signs – low or raised temperature, raised pulse rate, hypoxia (SpO_2 90-94%), and abnormal blood pressure – all showed significant associations with severity ($p < 0.001$ for most, $p = 0.026$ for SpO_2). SGOT (AST) was high in 41.5% and significantly associated ($p < 0.001$): 55.4% of those with high SGOT had severe dengue, and none with normal SGOT developed severe dengue. Similarly, SGPT (ALT) was high in 39.5% and significantly associated ($p < 0.001$): 53.2% of those with high SGPT had severe dengue. Hepatomegaly (29.0%), gallbladder wall edema (21.0%), ascites (20.0%), and pleural effusion (16.0%) were common findings; 49.0% had normal ultrasound. Non-severe dengue: 23.5%, dengue with warning signs: 50.5%, severe dengue: 26.0%.

Conclusion: Thrombocytopenia, particularly severe (<50,000/µL), is a strong and independent predictor of severe dengue. Moderate thrombocytopenia (50,000–99,999/µL) uniformly indicates dengue with warning signs, mandating close monitoring.

Keywords: Thrombocytopenia, Severity of Dengue Fever, hospitalized patients.

INTRODUCTION

Dengue is a major and escalating public health challenge in India, with evidence indicating that its true burden is grossly underestimated.

Thrombocytopenia is one of the most consistent and characteristic laboratory abnormalities observed in dengue infection and is defined as a platelet count below the normal range of 150,000–450,000 platelets/µL.[1] A rapid decline in platelet count usually begins around the fourth day of illness, with nadir levels often occurring between days 3 and 7, sometimes falling below 40,000 platelets/µL.[2] According to World Health Organization criteria, dengue hemorrhagic fever is defined by the presence of four key features: fever or recent history of fever lasting 2–7 days, hemorrhagic manifestations, thrombocytopenia with a platelet count below 100,000/µL, and evidence of increased vascular permeability. 3 Dengue shock syndrome represents the most severe form of the disease and is defined as DHF complicated by circulatory failure, manifested by a rapid and weak pulse, narrow pulse pressure (≤20 mmHg), or age-appropriate hypotension.[3] The case fatality rate in DSS may reach up to 44%, underscoring the need for early recognition and prompt management.

Early identification of patients at risk of developing severe dengue is crucial for timely intervention and optimal clinical management. Platelet count has been proposed as a readily available laboratory marker for predicting disease severity; however, the precise relationship between progressive thrombocytopenia and clinical deterioration remains incompletely understood, particularly in resource-limited settings. A rapid decline in platelet count in conjunction with rising hematocrit represents an important warning sign of impending plasma leakage and severe disease. In countries like India, where healthcare resources may be constrained, early identification of high-risk patients can facilitate targeted monitoring and efficient allocation of medical resources, thereby reducing morbidity and mortality.

India experiences endemic dengue transmission with marked seasonal variation and recurrent epidemic outbreaks, particularly during the monsoon period. Dengue has become a major cause of hospitalization in tertiary care centers across the country. Despite advances in supportive care, prognostication and early risk stratification of dengue patients remain challenging due to the lack of reliable early predictive markers. A systematic evaluation of the correlation between thrombocytopenia and dengue severity in hospitalized patients may provide valuable insights into disease progression and help identify simple laboratory predictors that can enhance clinical decision-making and improve patient outcomes in endemic regions.

Although thrombocytopenia is characteristic hematological abnormalities in dengue infection, the extent to which platelet count correlate with disease severity remains controversial. Several studies have reported inconsistent relation between platelet count and bleeding manifestation or progression to severe dengue. Further regional variation in dengue epidemiology and clinical profile necessitate local data therefore, the present study was conducted to evaluate the correlation between thrombocytopenia and severity of dengue infection among hospitalized patients in a tertiary care centre in Central India.

MATERIALS AND METHODS

This Hospital-based prospective observational study was conducted in the Department of General Medicine, including the medical and fever wards, at Bombay Hospital, Indore, Madhya Pradesh, India, a tertiary care teaching hospital. Duration of study was from October 2024 through December 2025. Prior to initiation of the study, approval was obtained from the Institutional Ethics Committee of Bombay Hospital, Indore.

Sample Size: 200 patients were included in the final analysis. Convenience sampling technique was used.

Inclusion Criteria

- Patients presenting with acute febrile illness (AFI) of 1–7 days duration.
- Age greater than 13 years, irrespective of gender
- Laboratory-confirmed dengue infection with IgM dengue serology positivity, with or without NS1 antigen positivity

Exclusion Criteria

- Patients presenting with dengue shock syndrome requiring immediate ICU admission before evaluation.
- Patients with negative IgM dengue serology
- Fever duration exceeding 7 days
- Patients with pre-existing chronic liver disease or chronic kidney disease
- Patients with known bleeding disorders, including hemophilia, thrombophilia, or other coagulopathies
- Patients receiving anticoagulant or antiplatelet therapy

Platelet Count Categories

For the purpose of analysis and to ensure clarity and reproducibility, platelet counts were categorized based on standard clinical thresholds. The categories were defined as follows:

- Normal platelet count: >150,000/µL
- Mild thrombocytopenia: 100,000–150,000/µL
- Moderate thrombocytopenia: 50,000–99,999/µL
- Severe thrombocytopenia: <50,000/µL

These predefined categories were used for all statistical comparisons and outcome assessments in the study.

Serological Testing

- IgM dengue antibody testing using ELISA or rapid diagnostic tests
- NS1 antigen testing, when available
- Biochemical Parameters
- Imaging Studies

Ultrasonography of the abdomen and pelvis was performed to assess for evidence of plasma leakage, including pleural effusion, ascites, gall bladder wall edema, and free fluid in the peritoneal or pleural cavities.

Inflammatory Markers

- C-reactive protein (CRP) was measured as a marker of systemic inflammation.

CLASSIFICATION OF DENGUE SEVERITY (WHO 2009)

Dengue cases in this study were classified according to the World Health Organization (WHO) 2009 dengue classification,[4] which categorizes patients based on clinical severity and risk of complications.

1. Dengue Without Warning Signs

Patients were classified as dengue without warning signs if they fulfilled the following criteria:

- History of residence in or travel to a dengue-endemic area within the preceding 14 days
- Presence of fever
- Presence of any two or more of the following:
  - Nausea and/or vomiting
  - Skin rash
  - Aches and pains (headache, retro-orbital pain, myalgia, arthralgia)
  - Positive tourniquet test

- Leukopenia

2. Dengue with Warning Signs

Patients were classified as dengue with warning signs if one or more of the following features were present:

- Abdominal pain or abdominal tenderness
- Persistent vomiting (more than three episodes in 12 hours)
- Clinical evidence of fluid accumulation (pleural effusion or ascites)
- Mucosal bleeding (e.g., bleeding gums, epistaxis)
- Lethargy or restlessness
- Hepatomegaly (> 2 cm)
- Laboratory evidence of:
  - Rising haematocrit
  - Rapidly falling platelet count

3. Severe Dengue

Patients were classified as having severe dengue if any one of the following life-threatening manifestations was present:

- Severe plasma leakage, leading to:
  - Dengue shock syndrome
  - Fluid accumulation with respiratory distress
- Severe bleeding, as assessed clinically (e.g., gastrointestinal bleeding requiring transfusion)
- Severe organ involvement, including:
  - Liver dysfunction (AST or ALT ≥ 1,000 IU/L)
  - Central nervous system involvement (altered sensorium, encephalitis)
  - Cardiac or other organ dysfunction (e.g., myocarditis)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Version 22. Descriptive statistics was presented in the form of numbers and percentages. Association between two categorical variables was assessed using Pearson Chi-square

Declaration of Helsinki and Go

RESULTS

The majority of patients (38.5%) were in the 21–30 years age group, followed by 31–40 years (20.0%) and 41–50 years (19.5%). A significant male predominance was observed, with 177 males (88.5%) and 23 females (11.5%), suggesting a higher incidence of dengue among males in the studied cohort.

The duration of fever was predominantly 4–7 days in 109 patients (54.5%), while 91 patients (45.5%) had fever for 1–3 days.

These findings indicate that most dengue patients in this cohort presented with a fever of 4–7 days, normal vital signs, and preserved oxygenation, with a smaller proportion exhibiting deviations from normal parameters.

Examination of the cardiovascular system (CVS) was normal in all patients (100.0%), and the respiratory system (RS) was normal in 194 patients (97.0%), with only 6 patients (3.0%) showing abnormal breath sounds or basal crepitations. Abdominal examination revealed a soft, non-tender abdomen in 111 patients (55.5%), while 89 patients (44.5%) had a soft but tender abdomen. The central nervous system (CNS) assessment showed that all patients (100.0%) were conscious and oriented.

These findings suggest that most patients had stable vital systems, minimal bleeding, and preserved neurological function, with tenderness on abdominal examination being the most common clinical abnormality.

Among the hematological parameters, hemoglobin (Hb) levels were low in 24 patients (12.0%), normal in 167 patients (83.5%), and raised in 9 patients (4.5%). Total leukocyte count (TLC) was decreased in 73 patients (36.5%), normal in 115 patients (57.5%), and elevated in 12 patients (6.0%).

Platelet count analysis showed that only 26 patients (13.0%) had normal platelet counts, while thrombocytopenia was observed in the majority of patients (87.0%). Specifically, 32 patients (16.0%) had mild thrombocytopenia, 48 patients (24.0%) had moderate thrombocytopenia, and 94 patients (47.0%) had severe thrombocytopenia.

Erythrocyte sedimentation rate (ESR) was raised in 71 patients (35.5%). C-reactive protein (CRP) levels were elevated in 188 patients (94.0%), with 128 patients (64.0%) having raised levels (7–40 mg/L) and 60 patients (30.0%) showing high levels (>40 mg/L).

Among biochemical parameters, random blood sugar (RBS) was normal in 198 patients (99.0%), with only 2 patients (1.0%) showing elevated values. Serum creatinine was within normal limits in 168 patients (84.0%), low in 18 patients (9.0%), and elevated in 14 patients (7.0%). Total bilirubin was normal in 78 patients (39.0%), mildly raised in 71 patients (35.5%), and high in 51 patients (25.5%), while direct bilirubin followed a comparable distribution.

Overall, the findings demonstrate that thrombocytopenia (particularly severe), leukopenia, and elevated liver enzymes are prominent features of dengue infection, whereas significant abnormalities in renal function and blood glucose levels were relatively uncommon in this study.

Hepatomegaly was observed in 58 patients (29.0%), and gallbladder wall edema was noted in 42 patients (21.0%). Ascites was present in 40 patients (20.0%), while pleural effusion was detected in 32 patients (16.0%). Periportal echogenicity or cuffing, indicative of hepatic involvement, was seen in 16 patients (8.0%).

These findings suggest that liver enlargement, gallbladder wall edema, and fluid accumulation in the abdomen or pleural space are common sonographic features in dengue, with nearly half of the patients showing normal imaging.

Regarding disease severity, 47 patients (23.5%) had non-severe dengue, 101 patients (50.5%) exhibited dengue with warning signs, and 52 patients (26.0%) were classified as having severe dengue. These results indicate that over three-quarters of the patients experienced either warning signs or severe forms of

the disease, showing a substantial burden of clinically significant dengue in this study.

Age was significantly associated with dengue severity (χ^2 = 28.245, df = 10, p = 0.002), with younger adults (21–40 years) more likely to present with dengue with warning signs or severe dengue, while older age groups (>50 years) had a higher proportion of non-severe cases. Sex did not show a statistically significant association with severity (χ^2 = 6.639, df = 4, p = 0.156).

Fever duration was significantly associated with disease severity (χ^2 = 13.833, df = 2, p = 0.001), with patients having 1–3 days of fever more likely to develop warning signs, whereas longer duration (4–7 days) was associated with severe dengue. Temperature (χ^2 = 31.632, df = 4, p < 0.001), pulse rate (χ^2 = 66.835, df = 2, p < 0.001), SpO_2 (χ^2 = 7.295, df = 2, p = 0.026), and blood pressure (χ^2 = 33.106, df = 2, p < 0.001) were also significantly associated with severity, indicating that elevated pulse rate, low or raised temperature, hypoxia, and hypotension were more commonly observed in severe dengue cases.

Overall, these results suggest that specific baseline clinical parameters - especially vital signs and oxygen saturation - can help predict progression to severe dengue.

Hemoglobin levels are significantly correlated with dengue severity, showing its potential role as a marker in clinical assessment.

Elevated hemoglobin likely reflects hemoconcentration secondary to plasma leakage which is characteristic feature of severe dengue.

Among patients with low TLC, 56.2% had dengue with warning signs, 27.4% had severe dengue, and 16.4% had non-severe dengue. Patients with normal TLC predominantly had dengue with warning signs (48.7%) and severe dengue (26.1%), while those with raised TLC mostly had non-severe dengue (50.0%).

These results suggest that while TLC varied among patients, it was not significantly correlated with dengue severity.

Table 1: Association Between Platelet Count and Severity of Dengue (n = 200)

Platelet Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Normal platelet count	23 (88.5%)	3 (11.5%)	0 (0.0%)	26 (100%)
Mild thrombocytopenia	22 (68.8%)	10 (31.3%)	0 (0.0%)	32 (100%)
Moderate thrombocytopenia	0 (0.0%)	48 (100.0%)	0 (0.0%)	48 (100%)
Severe thrombocytopenia	2 (2.1%)	40 (42.6%)	52 (55.3%)	94 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p = 0.001, Significant

Among patients with normal platelet counts, the majority had non-severe dengue (23; 88.5%), while a small proportion had dengue with warning signs (3; 11.5%), and none developed severe dengue. Similarly, among those with mild thrombocytopenia, most patients had non-severe dengue (22; 68.8%), followed by dengue with warning signs (10; 31.3%), with no cases of severe dengue.

All patients with moderate thrombocytopenia (48; 100.0%) presented with dengue with warning signs, and none were classified as non-severe or severe dengue.

In contrast, patients with severe thrombocytopenia predominantly had severe dengue (52; 55.3%), followed by dengue with warning signs (40; 42.6%), while only a small proportion had non-severe dengue (2; 2.1%).

Among patients with normal ESR, 51.2% had dengue with warning signs, 28.7% had non-severe dengue, and 20.2% had severe dengue. In patients with raised ESR, a higher proportion developed severe dengue (36.6%), while 49.3% had dengue with warning signs and 14.1% had non-severe dengue.

Elevated ESR is associated with increased severity of dengue, indicating its potential utility as a laboratory marker for predicting disease progression.

Among patients with normal CRP (≤6 mg/L), most had non-severe dengue (41.7%) or dengue with warning signs (41.7%), and only 16.7% developed severe dengue. In patients with moderately raised CRP (7–40 mg/L), 54.7% had dengue with warning signs and 18.8% had severe dengue. Notably, patients with high CRP levels (>40 mg/L) showed a higher proportion of severe dengue (43.3%), equal to those with warning signs, and only 13.3% had non-severe dengue.

Elevated CRP levels are significantly associated with greater severity of dengue, suggesting CRP as a useful inflammatory marker for identifying patients at risk of severe disease.

The association between RBS and dengue severity was not statistically significant (χ^2 = 5.750, df = 2, p = 0.056). These findings suggest that, in this study cohort, RBS levels were largely within normal limits and were not significantly associated with disease severity.

Table 2: Association Between Serum Creatinine Levels and Severity of Dengue (n = 200)

Serum Creatinine Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Low (< 0.6 mg/dL)	2 (11.1%)	12 (66.7%)	4 (22.2%)	18 (100%)
Normal (0.6–1.2 mg/dL)	39 (23.2%)	85 (50.6%)	44 (26.2%)	168 (100%)
Raised (> 1.2 mg/dL)	6 (42.9%)	4 (28.6%)	4 (28.6%)	14 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p = 0.213, Not Significant

The association between serum creatinine levels and dengue severity was not statistically significant (χ^2 = 5.815, df = 4, p = 0.213). These findings suggest that, in this cohort, serum creatinine levels were not a reliable predictor of dengue severity.

Table 3: Association Between Total Serum Bilirubin Levels and Severity of Dengue (n = 200)

Total Serum Bilirubin Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Normal (0.3–1.2 mg/dL)	47 (60.3%)	31 (39.7%)	0 (0.0%)	78 (100%)
Mildly Raised (1.3–2.0 mg/dL)	0 (0.0%)	70 (98.6%)	1 (1.4%)	71 (100%)
High (> 2.0 mg/dL)	0 (0.0%)	0 (0.0%)	51 (100.0%)	51 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p < 0.001, Significant

All patients with normal bilirubin (0.3–1.2 mg/dL) had either non-severe dengue (60.3%) or dengue with warning signs (39.7%), with none developing severe dengue. Patients with mildly raised bilirubin (1.3–2.0 mg/dL) predominantly had dengue with warning signs (98.6%), while only 1.4% developed severe dengue. Notably, all patients with high bilirubin levels (>2.0 mg/dL) had severe dengue (100.0%).

These findings indicate a strong positive correlation between elevated total serum bilirubin and dengue severity, highlighting its potential as a key biochemical marker for identifying patients at risk of severe disease.

Table 4: Association Between Direct Serum Bilirubin Levels and Severity of Dengue (n = 200)

Direct Bilirubin Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Normal (≤ 0.3 mg/dL)	47 (60.3%)	31 (39.7%)	0 (0.0%)	78 (100%)
Mildly Raised (0.4–0.8 mg/dL)	0 (0.0%)	70 (93.3%)	5 (6.7%)	75 (100%)
High (> 0.8 mg/dL)	0 (0.0%)	0 (0.0%)	47 (100.0%)	47 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p < 0.001, Significant

Patients with normal direct bilirubin (≤0.3 mg/dL) had either non-severe dengue (60.3%) or dengue with warning signs (39.7%), with none developing severe dengue. Those with mildly raised direct bilirubin (0.4–0.8 mg/dL) mostly had dengue with warning signs (93.3%), and a small proportion (6.7%) developed severe dengue. Importantly, all patients with high direct bilirubin levels (>0.8 mg/dL) presented with severe dengue (100.0%).

These results indicate a strong positive correlation between elevated direct bilirubin levels and dengue severity, supporting its role as a key biochemical marker for identifying patients at risk of severe disease.

Table 5: Association Between SGOT Levels and Severity of Dengue (n = 200)

SGOT Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Normal (≤ 40 IU/L)	25 (39.7%)	38 (60.3%)	0 (0.0%)	63 (100%)
Mildly Raised (41–100 IU/L)	20 (37.0%)	28 (51.9%)	6 (11.1%)	54 (100%)
High (101–1000 IU/L)	2 (2.4%)	35 (42.2%)	46 (55.4%)	83 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p < 0.001, Significant

Among patients with normal SGOT levels (≤40 IU/L), 60.3% had dengue with warning signs and 39.7% had non-severe dengue, with none developing severe dengue. Patients with mildly raised SGOT (41–100 IU/L) mostly had dengue with warning signs (51.9%) or non-severe dengue (37.0%), and a small proportion (11.1%) developed severe dengue. Notably, patients with high SGOT levels (101–1000 IU/L) predominantly had severe dengue (55.4%), with 42.2% having dengue with warning signs and only 2.4% having non-severe dengue.

These findings indicate a strong positive correlation between elevated SGOT levels and dengue severity, highlighting SGOT as a valuable biochemical marker for predicting progression to severe dengue.

Table 6: Association Between SGPT Levels and Severity of Dengue (n = 200)

SGPT Category	Severity of Dengue			Total
	Non-severe dengue	Dengue with warning signs	Severe dengue	
Normal (≤ 40 IU/L)	19 (50.0%)	19 (50.0%)	0 (0.0%)	38 (100%)
Mildly Raised (41–100 IU/L)	20 (24.1%)	53 (63.9%)	10 (12.0%)	83 (100%)
High (101–1000 IU/L)	8 (10.1%)	29 (36.7%)	42 (53.2%)	79 (100%)
Total	47 (23.5%)	101 (50.5%)	52 (26.0%)	200 (100%)

p < 0.001, Significant

Among patients with normal SGPT levels (≤40 IU/L), 50.0% had non-severe dengue and 50.0% had dengue with warning signs, with none developing severe dengue. Patients with mildly raised SGPT (41–100 IU/L) predominantly had dengue with warning signs (63.9%), while 12.0% progressed to severe dengue. In patients with high SGPT levels (101–1000 IU/L), the majority (53.2%) had severe dengue, 36.7% had dengue with warning signs, and only 10.1% had non-severe dengue.

These findings indicate that elevated SGPT levels are strongly associated with dengue severity, making SGPT a useful biochemical marker for identifying patients at risk of severe disease.

DISCUSSION

Age was significantly associated with dengue severity ($p = 0.002$), with younger adults (21–40 years) more likely to present with warning signs or severe dengue. Sex did not show a statistically significant association with severity ($p = 0.156$).

Vital signs including temperature ($p < 0.001$), pulse rate ($p < 0.001$), SpO_2 ($p = 0.026$), and blood pressure ($p < 0.001$) were all significantly associated with disease severity, with elevated pulse rate, hypoxia, and hypotension more commonly observed in severe dengue cases. Bleeding manifestations were observed in only 7.0% of patients, which is consistent with the findings of Giri et al. (2016),[5] who reported that although thrombocytopenia increased with clinical severity, bleeding frequency did not directly correlate with platelet count, as many patients with moderate thrombocytopenia exhibited bleeding while some with severe thrombocytopenia did not.

The association between platelet count categories and dengue severity was statistically highly significant ($\chi^2 = 197.389$, $df = 6$, $p = 0.001$).

A clear gradient of increasing severity with decreasing platelet counts was observed. These findings are strongly concordant with those of Diaz-Quijano et al. (2006),[6] who demonstrated that severe thrombocytopenia (platelet count <50,000/mm³) was strongly associated with hemorrhagic manifestations (OR = 3.16; 95% CI: 2.09–4.76; $p < 0.0001$) and signs of plasma leakage (OR = 2.67; 95% CI: 1.86–3.84; $p < 0.0001$).

Hemoglobin levels were significantly associated with dengue severity ($\chi^2 = 12.536$, $df = 4$, $p = 0.014$). This finding is consistent with Pathak et al. (2021),[7] who demonstrated that viral load positively correlated with hematocrit levels ($p < 0.05$), and with the WHO criteria which identify rising hematocrit as a warning sign of plasma leakage.

Total Leukocyte Count: Although leukopenia was observed in 36.5% of patients, the association between TLC and dengue severity was not statistically significant ($\chi^2 = 6.975$, $df = 4$, $p = 0.137$). This finding differs from Thapa et al. (2025),[8] who reported a significant association between leukopenia and disease severity ($\chi^2 = 13.268$, $p = 0.001$).

Erythrocyte Sedimentation Rate: ESR was raised in 35.5% of patients and showed a significant association with dengue severity ($\chi^2 = 8.959$, $df = 2$, $p = 0.011$).

C-Reactive Protein: CRP levels were elevated in 94.0% of patients and showed a significant association with severity ($\chi^2 = 15.998$, $df = 4$, $p = 0.003$). This finding underscores the role of systemic inflammation in severe dengue pathogenesis, consistent with the observations of de Azeredo et al. (2015),[9] who reported that elevated levels of proinflammatory cytokines including tumor necrosis factor-alpha, interleukin-6, and interleukin-8 correlate significantly with thrombocytopenia severity and disease progression.

Liver Function Tests: The most striking biochemical findings in this study were the strong associations between elevated liver enzymes and bilirubin with dengue severity.

Total and Direct Bilirubin: Both total and direct bilirubin levels demonstrated highly significant associations with dengue severity ($p < 0.001$ for both).

These findings are consistent with Ramalingam et al. (2024),[10] who reported that serum AST and ALT levels correlated inversely with thrombocytopenia ($p = 0.012$ and $p = 0.027$, respectively), indicating that elevated transaminases are associated with increased severity of thrombocytopenia. ALT ≥ 1000 IU/L) is a criterion for severe dengue in the WHO 2009 classification.

Renal Function Tests: Serum creatinine levels did not show a statistically significant association with dengue severity ($\chi^2 = 5.815$, $df = 4$, $p = 0.213$), and

blood urea was uniformly low in all patients. uncommon in this cohort, and these parameters may not serve as reliable predictors of dengue severity.

Random Blood Sugar: Although two patients with raised RBS developed severe dengue, the overall association was not statistically significant ($p = 0.056$), likely due to the small number of patients with abnormal values (only 2 out of 200).

Ultrasonography Findings

Ultrasonography revealed hepatomegaly in 29.0%, gallbladder wall edema in 21.0%, ascites in 20.0%, and pleural effusion in 16.0% of patients. These findings represent evidence of plasma leakage and fluid accumulation, which are hallmark features of severe dengue and dengue with warning signs.

Platelet Dynamics and Recovery

Several studies have examined platelet dynamics beyond absolute counts. Ojha et al. (2017),[1] demonstrated that platelet activation status is an important determinant of thrombocytopenia, with recovery observed from day 6 through day 10 coinciding with a decrease in platelet activation markers. Alonzo et al. (2012),[11] established that accelerated platelet clearance is overcome by thrombopoietin-induced enhanced thrombopoiesis, contributing to platelet count recovery.

The findings of this study are supported by multiple mechanistic studies. Chao et al. (2019),[12] identified that dengue virus nonstructural protein 1 activates platelets via Toll-like receptor 4, leading to thrombocytopenia and hemorrhage.

CONCLUSION

Thrombocytopenia, particularly severe (<50,000/μL), is a strong and independent predictor of severe dengue. Moderate thrombocytopenia (50,000–99,999/μL) uniformly indicates dengue with warning signs, mandating close monitoring. Elevated hemoglobin (hemoconcentration), raised ESR, high CRP, and markedly elevated liver enzymes (SGOT, SGPT) and bilirubin (total and direct) are significantly associated with severe dengue and serve as valuable complementary markers. Conversely, total leukocyte count, serum creatinine, and random blood sugar do not reliably predict severity. Ultrasonographic evidence of plasma leakage (gallbladder wall edema, ascites, pleural effusion) supports the clinical diagnosis of severe disease. These findings validate the WHO 2009 classification and demonstrate that a simple, inexpensive admission platelet count, combined with basic biochemical tests, can effectively risk-stratify dengue patients in resource-limited settings. Early identification of patients with moderate to severe thrombocytopenia enables targeted monitoring, timely intervention, and efficient resource allocation, thereby reducing dengue-related morbidity and mortality.

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