

Prognostic Significance of Aminotransferase Levels in Dengue: A Hospital-Based Study on AST and ALT as Markers of Disease Severity**Rahul Sharma¹, Vivek Bajaj¹, Ram Singh Maniram^{2*}, Simmi Dube³**¹PG Resident, Department of General Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India²MD Medicine, Associate Professor, Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India³MD Medicine, Professor and Head, Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India

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Abstract:**Background:** Dengue fever is a prevalent mosquito-borne viral illness with the potential for severe complications, including hepatic involvement. Elevated aminotransferase levels (AST/SGOT and ALT/SGPT) have been observed in dengue patients, and this study aims to investigate their correlation with disease severity and assess their potential as prognostic markers.**Aim and Objectives:** To measure AST and ALT levels in confirmed dengue patients, observe clinical outcomes in those with elevated levels, and evaluate the prognostic value of these enzymes for severe dengue.**Materials and Methods:** A hospital-based observational study was conducted at Gandhi Medical College and Hamidia Hospital, Bhopal, over one year. One hundred and fifty-one patients aged 14 years and older with confirmed dengue (positive for NS1 antigen by ELISA or rapid antigen detection kit) were included. Demographic data, clinical presentation, laboratory parameters (including complete blood count and liver function tests), and disease severity (classified according to WHO guidelines) were recorded. Patients were monitored in three phases of illness—febrile, critical, and convalescent—with serial assessments of aminotransferase levels. Statistical analysis was performed to assess correlations between aminotransferase levels and disease severity, and receiver operating characteristic (ROC) curve analysis was used to evaluate their predictive value for severe dengue.**Results:** A high prevalence of elevated aminotransferase levels was observed in dengue patients, with SGOT more frequently elevated than SGPT. Elevated aminotransferase levels were significantly associated with prolonged hospital and ICU stays, indicating their potential utility as prognostic markers. Significant correlations were found between elevated AST/ALT levels, thrombocytopenia, and severe clinical manifestations, including plasma leakage, severe bleeding, and organ dysfunction.**Conclusion:** Elevated AST and ALT levels are common in dengue patients and are associated with increased disease severity and prolonged hospitalizations. These findings suggest that aminotransferase levels could serve as valuable prognostic markers in identifying patients at higher risk for severe dengue. Routine liver function assessment and haematological monitoring are recommended for early identification and improved management of high-risk dengue patients.**Keywords:** Dengue fever, aminotransferase, AST, ALT, disease severity, prognostic markers, liver function, thrombocytopenia

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Introduction

Dengue fever is a significant public health concern, particularly in tropical and subtropical regions, where the burden of the disease continues to rise due to increasing urbanization, climate change, and inadequate vector control measures.[1] Caused by the dengue virus and transmitted by Aedes mosquitoes, the disease ranges in clinical severity from self-limiting febrile illness to severe manifestations such as dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS).[2, 3]

One of the critical systemic impacts of dengue infection is on the liver, which may present as elevated liver enzyme levels, hepatomegaly, or, in severe cases, acute liver failure. [3, 4] Aspartate transaminase (AST/SGOT) and alanine transaminase (ALT/SGPT) are sensitive markers of hepatic dysfunction and are frequently elevated in dengue patients. Elevated AST levels are typically higher than ALT, suggesting additional muscle involvement apart from hepatocellular injury. [5, 6]

Monitoring these enzymes can provide valuable insights into disease severity and guide clinical management. [7, 8]

This study was designed to determine the levels of AST and ALT in dengue patients and to analyse their association with clinical features, disease severity, and laboratory findings. By assessing liver enzyme levels in this patient population, we aim to contribute to the growing evidence on hepatic involvement in dengue and its implications for patient care.

Materials and Methods

This prospective observational study was conducted on patients presenting with fever and confirmed positive for dengue via NS1 antigen or dengue antigen ELISA test. The study includes patients aged 14 and older within 7 days of fever onset. It is designed to assess dengue patients' clinical and laboratory profiles over the three distinct phases of illness: febrile, critical, and convalescent.

Phases of Dengue Illness

For the purpose of this study, the phases of dengue illness are defined as follows:

1. **Febrile Phase:** Days 1 to 3
2. **Critical Phase:** Days 4 to 6
3. **Convalescent Phase:** Days 7 to 10

Patients were evaluated in each phase, with specific attention given to the progression and fluctuations in clinical symptoms and laboratory findings.

Inclusion Criteria

- Patients aged 14 years and older.
- Positive for dengue (NS1 antigen by rapid kit or dengue antigen by ELISA) within 7 days of fever onset.

Exclusion Criteria

- Patients younger than 14 years.
- Patients with known pre-existing liver conditions, including chronic hepatitis, chronic liver disease, liver cirrhosis, and liver malignancy.

Data Collection and Clinical Assessment: Patients meeting the inclusion criteria were enrolled in the study after obtaining informed consent. A detailed history and thorough clinical examination assessed the presenting symptoms, including fever, body aches, headache, nausea, vomiting, abdominal pain, and rashes. Hemodynamic parameters, such as pulse rate, blood pressure (BP), respiratory rate (RR), and signs of third-space fluid collection (such as pleural effusion and ascites), were documented.

Laboratory Investigations: All patients underwent baseline investigations on admission and were subjected to serial assessments across the three phases of dengue illness:

- **Complete Blood Count (CBC):** To monitor white blood cell count, haematocrit, and platelet levels.
- **Liver Function Tests (LFT):** To assess liver enzymes, including aspartate transaminase (AST/SGOT) and alanine transaminase (ALT/SGPT), along with bilirubin levels.
- **Renal Function Tests:** Urea and creatinine levels were measured to monitor renal function.
- **Electrolytes:** Sodium and potassium levels were checked for electrolyte balance.
- **Prothrombin Time (PT) and International Normalized Ratio (INR):** To evaluate blood coagulation status.
- **Ultrasonography (USG) of Abdomen:** To detect evidence of third-space fluid collection, hepatomegaly, and splenomegaly.
- **Chest X-ray:** To identify pleural effusions or other dengue-associated lung pathologies.

Monitoring and Serial Assessment: The patient's clinical condition and laboratory parameters were monitored serially during hospitalization through each phase of the illness. Vital signs, clinical symptoms, and hemodynamic stability were recorded daily. Laboratory tests, including liver enzymes (AST/ALT), were repeated at each phase to track disease progression and identify patterns related to liver involvement and overall illness severity.

Ethical Considerations: The study was conducted following ethical guidelines and was approved by the institutional ethics committee. Before enrolment, informed consent was obtained from all patients, and data confidentiality was maintained throughout the study.

Data Analysis: Data were collected, compiled, and analysed using appropriate statistical methods. The chi-square test was used to determine associations between categorical variables, while continuous variables were analysed for any significant changes across the three phases of dengue illness. Statistical significance was set at $p < 0.05$.

Results

The study included 151 confirmed dengue patients. Most cases (39.1%) were observed in individuals aged ≤ 25 years, with a declining trend in older age groups. Males constituted a higher proportion (66.2%) of cases compared to females (33.8%), but the distribution of dengue across age groups showed no significant gender-based differences (table 1).

Fever was a universal clinical feature (100%), followed by headache (49.7%), abdominal pain (43.7%), and vomiting or rashes (35.1% each). Severe dengue manifestations included plasma leakage in 21.9%, severe bleeding in 21.2%, and organ dysfunction in 11.9% of patients. Among other clinical findings, restlessness or lethargy was the most common (77.5%), followed by abdominal

pain (42.4%) and mucosal bleeding (28.5%). Hepatomegaly was observed in 23.2%, and features like increased haematocrit with decreased platelet levels were noted in 16.6% of patients. Most patients (45.7%) had a ward stay of ≤ 2 days, while only 15.9% required 6–8 days. ICU stays were predominantly brief, with 85.4% staying ≤ 2 days (table 1).

Table 1: Characteristics of the study population

Characteristics		Number of patients	Percentage
Age; years	≤ 25	59	39.1
	26–35	36	23.8
	36–45	28	18.5
	46–55	19	12.6
	≥ 56	9	6.0
Gender	Male	100	66.2
	Female	51	33.8
Clinical features	Fever	151	100.0
	Vomiting	53	35.1
	Headache	75	49.7
	Abdominal Pain	66	43.7
	Rashes	53	35.1
Clinical features indicative of severe dengue	Plasma leakage	33	21.9
	Severe bleeding	32	21.2
	Organ dysfunction	18	11.9
Presence of other relevant findings	Abdominal pain	64	42.4
	Persistent vomiting	25	16.6
	Clinical fluid accumulation	36	23.8
	Mucosal bleed	43	28.5
	Restlessness/Lethargy	117	77.5
	Hepatomegaly	35	23.2
	Increased Hematocrit and decreased platelets	25	16.6
Duration of Stay in Ward (days)	≤ 2	69	45.7
	3–5	58	38.4
	6–8	24	15.9
	≥ 9	0	0.0
Duration of Stay in ICU (days)	≤ 2	129	85.4
	3–5	21	13.9
	6–8	1	0.7
	≥ 9	0	0.0

Laboratory findings revealed that 77.5% of patients had haemoglobin levels ≥ 12.1 gm/dL and thrombocytopenia was common, with 67.6% having platelet counts $\leq 60,000$ cells/cu.mm. Elevated haematocrit levels were seen in 42.4% of patients, primarily in the 35.1–40% range. Liver enzyme

analysis showed significant elevations, with SGOT levels >100 U/L in 27.8% of cases and SGPT levels >100 U/L in 19.2%. SGOT was more frequently elevated than SGPT, indicating a greater impact on liver function during dengue infections (table 2

Table 2: Distribution of patients according to laboratory findings

Laboratory findings		Number of patients	Percentage
Haemoglobin Level (gm/dL)	≤8.0	6	4.0
	8.1–10	8	5.3
	10.1–12.0	20	13.2
	≥12.1	117	77.5
Total Platelet Count (cells/cu.mm of blood)	≤20000	30	19.9
	20001–40000	40	26.5
	40001–60000	32	21.2
	60001–80000	22	14.6
	80001–100000	8	5.3
	100001–120000	9	6.0
	120001–140000	3	2.0
>140000	7	4.6	
Total Haematocrit Values (%)	≤30	5	3.3
	30.1–35	14	9.3
	35.1–40	64	42.4
	40.1–45	41	27.2
	45.1–50	22	14.6
	≥50.1	5	3.3
SGOT Values	≤100	109	72.2
	101–200	24	15.9
	201–300	11	7.3
	301–400	2	1.3
	401–500	1	0.7
	≥501	4	2.6
SGPT Values	≤100	122	80.8
	101–200	20	13.2
	201–300	5	3.3
	≥301	4	2.6

Discussion

As a prevalent mosquito-borne viral illness, Dengue fever poses significant health challenges globally, particularly in endemic regions. Its varied clinical manifestations and potential for severe complications highlight the importance of identifying markers that can predict disease severity and guide management. In this study, we investigated the association between aminotransferase levels (AST/SGOT and ALT/SGPT) and disease severity in dengue patients, aiming to understand the prognostic value of these enzymes.

Our results demonstrate a high prevalence of elevated aminotransferase levels among dengue patients, consistent with findings from previous studies. Lee et al. [9] observed elevated AST levels in 86% and ALT in 46% of their patients, indicating frequent hepatic involvement in dengue. Verma et al. [10] reported that 71.4% of dengue patients had elevated liver enzymes, further supporting the relationship between dengue infection and hepatic

dysfunction. This hepatic involvement is attributed to direct viral injury to hepatocytes, immune-mediated damage, and hypoxia-related liver injury due to capillary leakage. Elevated AST/ALT levels, therefore, reflect not only liver involvement but may also serve as indicators of disease severity in dengue.

The association between elevated aminotransferase levels and prolonged hospital and ICU stays in our study underscores their potential utility as prognostic markers. Elevated SGOT and SGPT levels were significantly correlated with prolonged hospitalizations, suggesting that liver enzyme levels may help identify patients at higher risk of severe disease. Verma et al. [10] similarly noted a strong correlation between liver enzyme levels and clinical outcomes, indicating that aminotransferases could serve as reliable markers for monitoring disease progression.

Our findings also revealed significant associations between elevated aminotransferase levels,

thrombocytopenia, and clinical manifestations indicative of severe dengue, such as plasma leakage, severe bleeding, and organ dysfunction. Thrombocytopenia, a hallmark of dengue infection, was significantly associated with severe dengue in our cohort. This finding aligns with multiple studies that highlight the role of platelet count in assessing disease severity. The negative correlation between platelet count and aminotransferase levels observed in our study corroborates the findings of Verma et al. [10], who also reported this association. This relationship suggests that liver involvement in dengue may contribute to thrombocytopenia through impaired platelet production or increased platelet destruction, potentially exacerbated by immune mechanisms or direct viral effects on megakaryocytes.

Elevated haematocrit levels were also significantly associated with severe dengue in our study, consistent with Kularatnam et al. [11], who observed increased haematocrit levels during the critical phase of dengue haemorrhagic fever. Haemoconcentration, resulting from plasma leakage—a key feature of severe dengue—likely explains this observation. As plasma moves from the intravascular to extravascular compartments, the relative concentration of red blood cells rises, leading to elevated haematocrit levels. Monitoring haematocrit trends, therefore, may provide a valuable indicator of disease progression, particularly in identifying patients at risk of severe dengue.

Regarding demographic characteristics, our study observed a male predominance (66.2%) in dengue cases, similar to the findings of Verma et al. [10], who reported a 71% male majority. This gender disparity may be due to behavioural and environmental factors that expose males to mosquitoes more frequently. However, our findings contrast with Sangkaew et al. [12], who noted a slightly higher risk of severe dengue in females (OR 1.13, 95% CI 1.01-1.26), particularly in children. Our study did not stratify severity by gender, and the reasons for these gender differences in dengue susceptibility remain unclear, warranting further investigation.

Our age-based analysis revealed that younger individuals (≤ 25 years) constituted the highest proportion of cases (39.1%). This distribution aligns with Lee et al. [13], who reported a median age of 32 among dengue patients. However, we did not observe a significant association between age and disease severity. Other studies have reported varying results on this front. Srividya et al. [14] found a higher prevalence of elevated liver enzymes in older children with severe dengue, indicating a potential age-related effect on disease severity in pediatric populations. Conversely, Sangkaew et al. [12] reported a link between younger age and severe

dengue in children but not adults. These conflicting findings highlight the complex relationship between age and dengue severity, potentially influenced by immune status, pre-existing comorbidities, and viral serotypes.

Haematological parameters are critical in understanding dengue pathophysiology. Our study found no significant difference in haemoglobin levels between severe and non-severe cases, consistent with Lee et al. [13], who also observed no association between haemoglobin and disease severity. While some studies suggest anemia may be a complication of severe dengue due to bleeding, haemolysis, or bone marrow suppression, our findings did not reveal this trend. White blood cell counts, often expected to be lower in severe cases, did not differ significantly between severe and non-severe dengue in our study, contrasting with the meta-analysis by Sangkaew et al. [12], which reported lower WBC counts in severe dengue. Variations in study populations, timing of sampling, or dengue serotypes may explain these discrepancies.

Limitations and Future Directions

This study highlights the high importance of elevated SGOT and SGPT levels in patients with dengue, highlighting their potential as prognostic markers for risk stratification and personalized management. However, its observational design limits causality and the small sample size and single-center setting may affect generalizability. Future research should focus on larger, prospective, multi-center studies with diverse populations, incorporating biomarkers like cytokines, coagulation factors, and the AST to Platelet Ratio Index (APRI) to enhance prognostic accuracy. Additionally, longitudinal analysis of viral serotypes and loads could deepen understanding of dengue pathophysiology and support personalized treatment strategies. Despite these limitations, this study adds to the growing evidence of liver involvement in dengue. It emphasizes the need for further exploration to refine diagnostic and therapeutic approaches, ultimately aiming to reduce dengue-related morbidity and mortality.

Conclusion

Our study reinforces the importance of aminotransferase levels as potential prognostic markers in dengue management. Elevated SGOT and SGPT levels are common among dengue patients and correlate with disease severity, as reflected in prolonged hospital stays and associations with thrombocytopenia and plasma leakage. These findings suggest that liver function assessment and haematological parameters should be integrated into routine evaluation for dengue patients to identify those at risk of severe disease and improve patient outcomes.

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