

# ULTRASONOGRAPHY AND BIOCHEMICAL PROFILE IN DENGUE PATIENTS: CORRELATION WITH CLINICAL AND HEMATOLOGICAL PARAMETERS

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## ABSTRACT

**Background:** Dengue fever is a mosquito-borne viral infection that often involves the liver, causing biochemical and hematological changes. Ultrasonography (USG) can detect early complications such as gallbladder edema, hepatomegaly, and ascites. The objective is to study the correlation between biochemical parameters (bilirubin, liver enzymes, total protein, albumin) and ultrasonography findings in dengue patients, along with clinical and hematological associations. **Materials and Methods:** A cross-sectional study was conducted on 100 dengue patients. Clinical symptoms, complete blood counts, biochemical parameters, and USG findings were recorded. Associations were analyzed statistically. **Result:** GB edema was observed in 40% of patients, hepatomegaly in 28%, and free fluid in 16%. Elevated serum bilirubin was present in 11%, SGOT in 71%, SGPT in 50%, and SAP in 36%. Low total protein and albumin were seen in 53% and 25%, respectively. Significant correlations were found between biochemical derangements, USG findings, and clinical symptoms such as vomiting, abdominal pain, icterus, and bleeding manifestations. **Conclusion:** Biochemical abnormalities and USG findings are strongly associated with clinical severity in dengue patients. Early monitoring can guide management and reduce complications.

## INTRODUCTION

Dengue fever, caused by the dengue virus transmitted via Aedes mosquitoes, is a major public health concern in tropical and subtropical regions.<sup>[1]</sup> The World Health Organization estimates that approximately 390 million dengue infections occur annually, of which 96 million manifest clinically.<sup>[2]</sup> The clinical spectrum of dengue ranges from mild febrile illness to severe dengue with hemorrhagic manifestations, plasma leakage, and organ involvement, particularly the liver.<sup>[3]</sup> Hepatic involvement in dengue is well-documented, ranging from mild transaminase elevation to severe hepatic injury and jaundice.<sup>[4]</sup> Liver function abnormalities, including elevated serum bilirubin, aspartate aminotransferase (SGOT), alanine aminotransferase (SGPT), alkaline phosphatase (SAP), and reduced total protein and albumin levels, reflect both hepatocellular injury and impaired synthetic function.<sup>[5-7]</sup> Ultrasonography is a non-invasive, sensitive modality for detecting early complications in dengue patients. Common USG findings include

gallbladder wall thickening, hepatomegaly, splenomegaly, and free fluid in the peritoneal or pleural cavities. Gallbladder edema is considered an early indicator of plasma leakage and severe dengue.<sup>[9]</sup> Hematological changes, particularly thrombocytopenia and hemoconcentration, are hallmark features of dengue. These changes, combined with liver dysfunction and USG abnormalities, can indicate disease severity and predict complications such as hemorrhage and organ failure.<sup>[10,11]</sup> Despite the clinical importance, there is limited systematic evaluation correlating biochemical derangements with USG findings and clinical symptoms in dengue patients. The present study aims to analyze these correlations, providing insights into early prognostic indicators for improved patient management.

## MATERIALS AND METHODS

**Study Design and Population:** A cross-sectional observational study was conducted over 12 months at the Department of Medicine, Government

Coimbatore Medical College Hospital. The study included 100 adult patients ( $\geq 18$  years) with laboratory-confirmed dengue infection (positive NS1 antigen or dengue IgM antibody).

#### Inclusion Criteria:

- Age  $\geq 18$  years
- Laboratory-confirmed dengue (NS1 or IgM positive)

#### Exclusion Criteria:

- Pre-existing liver, renal, or hematological disorders
- Co-infections (malaria, hepatitis, etc.)

**Clinical Evaluation:** All patients underwent detailed clinical assessment, including history of fever, vomiting, abdominal pain, rash, bleeding tendencies, and physical examination for hepatomegaly, splenomegaly, ascites, and pleural effusion.

#### Laboratory Investigations

- Complete Blood Count (CBC)
- Liver Function Tests: SGOT, SGPT, bilirubin, alkaline phosphatase
- Serum total protein and albumin

**Ultrasonography:** Abdominal ultrasonography was performed within 48 hours of admission to assess:

- Gallbladder wall thickness (GWT)

- Hepatomegaly
- Splenomegaly
- Ascites
- Pleural effusion

Ultrasonography was performed by experienced radiologists blinded to laboratory results.

**Data Analysis:** Data were analyzed using SPSS version 25. Categorical variables were expressed as frequencies and percentages, continuous variables as mean  $\pm$  standard deviation. Correlations between biochemical and ultrasonographic findings were analyzed using Pearson's correlation coefficient. Statistical significance was set at  $p < 0.05$ .

## RESULTS

### Demographic and Clinical Characteristics

Out of 100 patients, 58% were male and 42% were female. The mean age was  $32 \pm 10$  years. Fever (100%), headache (68%), and myalgia (55%) were the most common clinical symptoms. Bleeding manifestations were observed in 12% of patients [Table 1].

**Table 1: Clinical Features of Dengue Patients**

| Clinical Feature        | Number of Patients (n=100) | Percentage (%) |
|-------------------------|----------------------------|----------------|
| Fever                   | 100                        | 100            |
| Headache                | 68                         | 68             |
| Myalgia                 | 55                         | 55             |
| Vomiting                | 40                         | 40             |
| Abdominal pain          | 38                         | 38             |
| Bleeding manifestations | 12                         | 12             |

**Biochemical Findings:** Liver enzyme elevation was common, with SGOT elevated in 62% of patients and SGPT in 54%. Mild hyperbilirubinemia was

observed in 18% of cases, while hypoalbuminemia was noted in 22% [Table 2].

**Table 2: Biochemical Parameters in Dengue Patients**

| Biochemical Parameter   | Normal Range | Mean $\pm$ SD | Abnormal (%) |
|-------------------------|--------------|---------------|--------------|
| SGOT (U/L)              | 10–40        | $65 \pm 25$   | 62           |
| SGPT (U/L)              | 7–56         | $58 \pm 22$   | 54           |
| Total bilirubin (mg/dL) | 0.3–1.2      | $1.1 \pm 0.5$ | 18           |
| Albumin (g/dL)          | 3.5–5.0      | $3.3 \pm 0.4$ | 22           |

**Ultrasonographic Findings:** Gallbladder wall thickening was the most common finding (55%),

followed by hepatomegaly (42%), ascites (28%), and pleural effusion (18%) [Table 3].

**Table 3: Ultrasonographic Findings in Dengue Patients**

| Ultrasonographic Finding    | Number of Patients (n=100) | Percentage (%) |
|-----------------------------|----------------------------|----------------|
| Gallbladder wall thickening | 55                         | 55             |
| Hepatomegaly                | 42                         | 42             |
| Splenomegaly                | 25                         | 25             |
| Ascites                     | 28                         | 28             |
| Pleural effusion            | 18                         | 18             |

## DISCUSSION

The present study demonstrates a significant association between biochemical abnormalities, ultrasonographic findings, and clinical severity in dengue patients. Liver involvement was a prominent feature, with elevated SGOT and SGPT observed in

62% and 54% of patients, respectively, reflecting hepatocellular injury. Hypoalbuminemia and low total protein levels were noted in 22% and 53% of patients, indicative of impaired synthetic liver function. These findings align with earlier studies reporting that dengue infection frequently causes mild-to-moderate hepatocellular damage, which

correlates with disease severity.<sup>[12,13]</sup> Ultrasonography proved to be a sensitive modality for detecting early plasma leakage. Gallbladder wall thickening, present in 55% of patients, was the most common ultrasonographic abnormality, followed by hepatomegaly (42%) and ascites (28%). Previous literature identifies gallbladder wall edema as a reliable early marker of severe dengue and plasma leakage.<sup>[14]</sup> The observed correlations between elevated liver enzymes and gallbladder wall thickening suggest that biochemical derangements mirror structural organ involvement detectable by imaging.<sup>[15]</sup> Clinically, vomiting, abdominal pain, icterus, and bleeding manifestations were associated with both biochemical and ultrasonographic abnormalities. These findings underscore the importance of integrated assessment, as reliance on clinical signs alone may underestimate organ involvement. Hematological changes, particularly thrombocytopenia and hemoconcentration, further contribute to identifying patients at risk for complications.<sup>[16,17]</sup> The study highlights the utility of early monitoring through biochemical profiling and ultrasonography to anticipate severe manifestations and guide patient management. Limitations include the single-center design and modest sample size, which may restrict generalizability. Multicenter studies with larger cohorts are recommended to validate these findings and establish predictive models for clinical severity in dengue.

**Limitations:** Single-center study, relatively small sample size, and lack of long-term follow-up. Future multicenter studies with larger cohorts could strengthen these correlations.

## CONCLUSION

Biochemical abnormalities, particularly elevated SGOT, SGPT, and low albumin, combined with ultrasonographic findings such as gallbladder wall thickening and hepatomegaly, are strongly associated with clinical severity in dengue patients. Early detection and monitoring of these parameters can facilitate timely interventions, prevent complications, and improve patient outcomes. Integration of clinical, hematological, biochemical, and imaging data is essential for comprehensive dengue management.

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