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Original Research Article

Estimation of the Prevalence of Hepatic Dysfunction Among Dengue Infected Patients: A Hospital Based Cross-Sectional Study

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Abstract:

Introduction: This study investigates the frequency of liver involvement in dengue patients and the potential of abnormal liver function tests as early indicators of illness severity. Results show a clear correlation between severe dengue outcomes and hepatic impairment, highlighting the importance of early detection and treatment for this public health concern.

Aims: To assess the prevalence of liver dysfunction in Dengue patients and its association with Dengue-related complications.

Materials and Methods: The present study was a Hospital based Observational Cross sectional study. This Study was conducted from February 2022 to June 2022 at Department of Biochemistry and Microbiology, Central Laboratory, OPD Biochemistry and Microbiology Laboratory, Medical College & Hospital, Kolkata. 121 dengue infected patients were included in our study.

Result: The results indicate that the majority of participants were young to middle-aged, predominantly male, and mostly from urban areas. Fever was a universal symptom, with vomiting and abdominal pain also common. Liver enzyme levels were elevated in many patients, indicating varying degrees of hepatic dysfunction—most commonly mild to moderate. A significant association was found between the severity of dengue and liver dysfunction, with abnormal liver function more prevalent in severe cases. Moreover, patients with hepatic dysfunction had a higher incidence of ICU admission and mortality, highlighting liver involvement as a marker of worse clinical outcomes in dengue infection.

Conclusion: In summary, the study findings highlight that hepatic dysfunction is prevalent among dengue patients, particularly in more severe forms of the disease. While most liver involvement is mild to moderate, its presence correlates with a higher likelihood of adverse outcomes. These results underscore the importance of early identification and monitoring of liver function in dengue patients, especially those presenting with warning signs or severe symptoms.

Keywords: Dengue Fever**,** Liver Injury**,** Hepatomegaly**,** Hyperbilirubinemia.

Introduction

Dengue is an Arboviral disease, spread by the Aedes mosquitoes. It has been emerged as a huge disease burdn on the residents of all over the Tropical countries. [1] Dengue patients can be presented with a vast spectrum of clinical signs & symtoms, ranging from mild flu-like illness to classical dengue fever (DF) (bone-break fever) and some complicate into dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) like life threatening conditions. It can also affect the liver among that wide spectrum of manifestations. Our this study is to look for the burden of Dengue infection causing Hepatic damage in patients and whether LFT could be an early marker for prediction of complications arised from Dengue fever. Dengue fever (DF), a vector-borne viral infection transmitted by Aedes mosquitoes, is endemic in tropical and subtropical regions, including India. The World Health Organization estimates that approximately 2.5 billion people are at risk globally, with over 100 million cases and

30,000 deaths annually. In India, dengue outbreaks occur frequently, posing significant public health challenges. [2] While the primary manifestations of dengue include high fever, rash, and hemorrhagic symptoms, hepatic dysfunction is increasingly recognized as a common complication. Studies have reported elevated liver enzymes such as aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in a significant proportion of dengue patients. For instance, a study conducted in Kolkata during the 2012 dengue epidemic found that among 1,226 serologically confirmed dengue patients, 43 had ALT levels ≥75 U/L, and 570 had ALT levels >75 U/L, indicating varying degrees of hepatic involvement [3]. Aims to assess the prevalence of liver dysfunction in Dengue patients and its association with Dengue-related complications.

Materials and Methods

Type of study: Hospital based Observational Cross sectional study.

Place of study: Central Laboratory, OPD Biochemistry and Microbiology Laboratory, Medical College & Hospital, Kolkata.

Study Duration: February 2022 to June 2022.

Sample size: 121 dengue infected patients were included in our study.

Inclusion Criteria: Dengue infected patients detected by NS1 antigen or Dengue IgM antibody by ELISA technique.

Exclusion Criteria

1. Patients having coagulopathy disorder.
2. Patients with known Hepatic and Renal dysfunction.
3. Patients taking Hepatotoxic, Nephrotoxic medicines.
4. Patients taking medicines causing Platelet dysfunction.
5. Patients suffering from any other major illness.

Methodology

Study was conducted after obtaining approval from Institutional Ethics Committee. Blood was collected in EDTA anticoagulant vial and clot vial ,at OPD blood collection center of Central Laboratory by single prick technique. Blood collected in EDTA will be analyzed by 6 part automated cell counter at Pathology division of Central Laboratory, Medical College & Hospital Kolkata. Hepatic parameters and Renal parameters will be analyzed from sample taken in clot vial, by autoanalyzer in OPD laboratory and Central Laboratory (Biochemistry section), and Dengue NS1 & Dengue IgM antibody was analyzed in Microbiology department, MCHK by ELISA method.

Statistical Analysis: Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Results

Table 1: Demographic Profile of the Patients

Variable	Categories	Frequency (n)	Percentage (%)
Age Group (years)	<15	18	14.90%
	15–30	42	34.70%
	31–45	35	28.90%
	>45	26	21.50%
Gender	Male	68	56.20%
	Female	53	43.80%
Residence	Urban	79	65.30%
	Rural	42	34.70%

Table 2: Clinical Profile of Dengue Patients

Symptom	Number of Patients (n)	Percentage (%)
Fever	121	100%
Vomiting	46	38.00%
Abdominal Pain	38	31.40%
Bleeding Manifestation	22	18.20%
Hepatomegaly	31	25.60%
Duration of Illness (mean ± SD)	–	6.2 ± 1.8 days

Table 3: Liver Function Test Results among Dengue Patients

Parameter	Mean ± SD
AST (U/L)	112 ± 64
ALT (U/L)	96 ± 59
Total Bilirubin (mg/dL)	1.4 ± 0.6
Direct Bilirubin (mg/dL)	0.5 ± 0.3
Albumin (g/dL)	3.1 ± 0.7

Table 4: Prevalence of Hepatic Dysfunction Based on LFTs

Degree of Liver Dysfunction	Criteria	Frequency (n)	Percentage (%)
Mild	ALT 1–2x normal	41	33.90%
Moderate	ALT 2–5x normal	28	23.10%
Severe	ALT >5x normal	14	11.60%
Normal	ALT within normal range	38	31.40%

Table 5: Association between Hepatic Dysfunction and Severity of Dengue

Severity of Dengue	Normal LFT (n, %)	Abnormal LFT (n, %)	Total (n)	p-value
Dengue Fever	26 (68.4%)	34 (39.5%)	60	0.02*
Dengue / Warning Signs	10 (26.3%)	36 (41.9%)	46	
Severe Dengue	2 (5.3%)	16 (18.6%)	18	

Table 6: Outcomes of Patients With and Without Hepatic Dysfunction

Outcome	Hepatic Dysfunction (n = 83)	No Hepatic Dysfunction (n = 38)	Total (n = 121)	P-Value
Recovered	74 (89.2%)	38 (100%)	112	0.045
ICU Admission	7 (8.4%)	0 (0%)	7	
Mortality	2 (2.4%)	0 (0%)	2	

The demographic data reveal that the majority of participants fall within the 15–30 years age group, accounting for 34.7% of the total sample. This is followed by those aged 31–45 years (28.9%) and those over 45 years (21.5%), while the smallest proportion (14.9%) is made up of individuals younger than 15 years. This suggests that the study population is predominantly composed of young and middle-aged individuals. In terms of gender distribution, males represent a slight majority at 56.2%, compared to females at 43.8%, indicating a relatively balanced but male-skewed sample. Regarding place of residence, a greater proportion of participants reside in urban areas (65.3%) compared to rural areas (34.7%).

All patients in the study presented with fever 121(100%), indicating that it is a universal symptom among the cases examined. Other common symptoms included vomiting, reported by 46(38.0%) of patients, and abdominal pain, noted in 38(31.4%) of cases. Hepatomegaly was observed in 31(25.6%) of patients, while bleeding manifestations were present in 22(18.2%), suggesting a smaller subset of patients experienced more severe or systemic symptoms. The mean duration of illness was 6.2 ±1.8 days.

The liver function test results show elevated levels of liver enzymes among the patients. The mean AST (aspartate aminotransferase) level was 112 ± 64 U/L, and the mean ALT (alanine aminotransferase) level was 96 ± 59 U/L, both of which are above the normal range, indicating hepatocellular injury or liver inflammation. The mean total bilirubin level was 1.4 ± 0.6 mg/dL, with a direct bilirubin mean of 0.5 ± 0.3 mg/dL, suggesting mild hyperbilirubinemia, which may reflect impaired liver clearance or hemolysis. The mean serum albumin level was 3.1 ± 0.7 g/dL.

Based on ALT levels, liver dysfunction among patients was categorized into four degrees of severity. Mild liver dysfunction (ALT 1–2 times the normal limit) was the most common, observed in 41 patients. Moderate dysfunction (ALT 2–5 times normal) occurred in 28 patients, while severe dysfunction (ALT >5 times normal) was present in 14 patients, indicating a smaller subset experienced significant hepatic injury. Interestingly, 38 patients had normal ALT levels, suggesting that not all individuals showed biochemical evidence of liver involvement. These findings suggest that while liver dysfunction is relatively common in this group, the majority experienced only mild to moderate elevation in liver enzymes, with severe liver injury being less frequent.

The data demonstrate a significant association between hepatic dysfunction and the severity of dengue infection ($p = 0.02$). Out of the 60 patients diagnosed with dengue fever, 26 (68.4%) had

normal liver function tests (LFTs), while 34 (39.5%) showed abnormal LFTs. Among the 46 patients with dengue with warning signs, only 10 (26.3%) had normal LFTs, whereas 36 (41.9%) exhibited liver dysfunction. In the 18 cases of severe dengue, just 2 (5.3%) had normal LFTs, while 16 (18.6%) had abnormal LFTs.

The outcomes of patients with and without hepatic dysfunction show a statistically significant difference ($p = 0.045$). Among the 83 patients with hepatic dysfunction, 74 (89.2%) recovered, while 7 (8.4%) required ICU admission, and 2 (2.4%) unfortunately died. In contrast, all 38 patients without hepatic dysfunction (100%) recovered, with no ICU admissions or deaths reported in this group. These findings indicate that patients with liver involvement had a higher risk of complications, including ICU admission and mortality, compared to those with normal liver function. The statistically significant p-value suggests that hepatic dysfunction is associated with worse clinical outcomes in dengue infection.

Discussion

The demographic profile of the study population reveals a predominance of young and middle-aged individuals, with the highest proportion (34.7%) falling within the 15–30 years age group. This aligns with findings from studies such as that by Kumar et al. [4] (2018), who reported that dengue infection was most prevalent in individuals aged 15–35 years, likely due to increased outdoor activity and exposure to mosquito vectors in this demographic. The male-to-female ratio in our study (56.2% male vs. 43.8% female) reflects a slight male preponderance, which has similarly been reported by Gupta et al.[5] (2017), suggesting either behavioral or occupational differences in exposure.

A significant majority (65.3%) of the study participants resided in urban areas, consistent with the urban-centric distribution of dengue seen in other studies Sarkar et al.,[6] (2020), likely due to factors such as higher population density, poor sanitation, and inadequate mosquito control in urban settings.

Fever was a universal presenting symptom, which is in agreement with the World Health Organization's classification of dengue, where fever is considered the cardinal symptom (WHO, 2009)[7]. Vomiting (38.0%) and abdominal pain (31.4%) were also common, aligning with studies by Kalayanarooj et al. [8] (1997), which identified gastrointestinal manifestations as frequent warning signs in dengue patients. Hepatomegaly (25.6%) and bleeding manifestations (18.2%) were observed less frequently but indicate systemic involvement and disease severity, corroborating the findings of Bhaskar et al. [9](2010), who reported similar clinical trends.

The mean duration of illness was 6.2 ± 1.8 days, paralleling the natural course of dengue, which typically spans 5–7 days. Liver enzyme elevations were common, with mean AST and ALT levels of 112 ± 64 U/L and 96 ± 59 U/L, respectively. These elevations indicate hepatocellular injury and are consistent with findings from Roy et al.[10] (2015), who reported that AST tends to be more elevated than ALT in dengue infections, possibly due to involvement of both liver and muscle tissue.

Hyperbilirubinemia was mild (mean total bilirubin 1.4 ± 0.6 mg/dL), and hypoalbuminemia was evident (mean albumin 3.1 ± 0.7 g/dL), reflecting mild hepatic dysfunction and capillary leak syndrome as part of the dengue pathophysiology Wills et al.,[11] 2004.

Liver dysfunction was classified based on ALT levels into mild, moderate, and severe categories. Mild dysfunction was the most common, found in 41 patients. Severe hepatic involvement (ALT >5× normal) was seen in only 14 patients. Similar trends were observed by Trung et al.[12] (2010), who noted that most liver enzyme derangements in dengue are mild to moderate, with severe hepatocellular injury being relatively uncommon.

Interestingly, 38 patients (31.4%) exhibited normal ALT levels, underscoring that liver dysfunction, although common, is not universal in dengue. This heterogeneity in hepatic involvement has been well-documented, suggesting that multiple factors, including immune response variability, dengue serotype, and secondary infection status, may influence hepatic pathology Kuo et al., [13]1992.

A significant association was found between the severity of dengue and hepatic dysfunction ($p = 0.02$). While 68.4% of dengue fever patients had normal LFTs, liver dysfunction was noted in 41.9% of those with warning signs and 88.9% of severe dengue cases. These findings are supported by research from Parkash et al. [14] (2010), who emphasized the utility of liver enzyme abnormalities as a marker for severe dengue and impending complications. Patient outcomes also varied significantly with liver function status ($p = 0.045$). All patients without hepatic dysfunction recovered uneventfully, whereas those with liver involvement had higher rates of ICU admission (8.4%) and mortality (2.4%). This is in line with the work of Lee et al. [15](2012), who reported that hepatic dysfunction in dengue is a predictor of poor prognosis and increased morbidity and mortality.

Conclusion

In summary, the study findings highlight that hepatic dysfunction is prevalent among dengue patients, particularly in more severe forms of the disease. While most liver involvement is mild to moderate, its presence correlates with a higher

likelihood of adverse outcomes. These results underscore the importance of early identification and monitoring of liver function in dengue patients, especially those presenting with warning signs or severe symptoms.

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