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Original Research Article

Association between Dengue Severity and Liver Function in Patients Admitted to a Tertiary Care Hospital in Dhaka, Bangladesh

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Abstract: Dengue fever is a significant public health concern in tropical and subtropical regions, including Bangladesh, where it poses a substantial burden on healthcare systems due to its high incidence and potential complications. To assess the association between dengue severity and liver function in patients admitted to a tertiary care hospital in Dhaka, Bangladesh. This observational study included 130 dengue patients admitted between July and December 2023. Demographic data, clinical symptoms, dengue severity classification, and liver function tests (ALT, AST) were recorded. Statistical analyses, including chi-square and Fisher's exact tests, were performed to evaluate the association between dengue severity and hepatitis, with significance set at $p < 0.05$. The majority of patients were aged 21–30 years (40.0%) and 10–20 years (22.3%). Fever was present in all cases, with abdominal pain (46.2%), vomiting (47.7%), and diarrhea (44.6%) being common. Dengue with warning signs was the most frequent diagnosis (69.2%), followed by severe dengue (16.9%) and dengue without warning signs (13.8%). Elevated SGOT and SGPT levels were observed in 67.7% and 56.2% of patients, respectively. A significant association was found between dengue severity and elevated liver enzymes ($p < 0.001$). Dengue severity is strongly associated with elevated liver enzymes, suggesting a link between dengue infection and hepatitis. These findings highlight the importance of routine liver function monitoring in dengue patients for early detection and management of hepatic complications.

Keywords: Dengue severity, Liver dysfunction, Hepatitis, ALT, AST, Tertiary care hospital.

INTRODUCTION

Dengue fever, a mosquito-borne viral illness caused by the dengue virus (DENV), poses a significant global health challenge, particularly in tropical and subtropical regions (de Almeida *et al.*, 2025). The World Health Organization (WHO) estimates that nearly half the global population is at risk of dengue, with over 100 million symptomatic cases reported annually (*Dengue (Human) | UNDRR*, 2023). Bangladesh, a densely populated South Asian country, has faced recurrent dengue outbreaks, particularly in urban Dhaka, due to environmental and climatic factors favoring Aedes aegypti mosquitoes (*Dengue outbreak 2023 in Bangladesh: From a local concern to a global public health issue - Sumaiya Binte Reza, Md. Masuk-Ur-Rahman Shoukhin, Sakif Ahamed Khan, Syed Masudur Rahman Dewan, 2024*, no date).

Dengue infection manifests a wide clinical spectrum, ranging from mild febrile illness to severe life-threatening conditions, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) (*Dengue and Dengue Hemorrhagic Fever - PMC*, no date). Severe forms of dengue are characterized by plasma leakage, hemorrhage, and multi-organ involvement (*Severe Dengue - an overview | ScienceDirect Topics*, no date). The liver is highly

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vulnerable to dengue, experiencing direct viral invasion and immune-mediated damage, leading to elevated transaminases, hepatomegaly, and, in severe cases, acute liver failure (Alam, Rukunuzzaman and Nahid, 2023).

Liver dysfunction in dengue can be influenced by multiple factors, including viral replication, host immune response, and pre-existing liver conditions (*Liver involvement in dengue: A systematic review - Campana - 2024 - Reviews in Medical Virology - Wiley Online Library*, no date). Elevated levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST), often observed in dengue patients, are indicators of hepatocellular injury and correlate with disease severity (Kalluru *et al.*, no date). A study conducted in Coastal India found that serum glutamic-oxaloacetic transaminase (SGOT) was elevated in 66.7%, 78.6%, and 91.7% of patients with dengue without warning signs, with warning signs, and severe dengue, respectively (Swamy, Mahesh and Rajashekar, 2021a). Similarly, serum glutamic-pyruvic transaminase (SGPT) was elevated in 42.4%, 52.4%, and 91.7% of patients across the same categories (Swamy, Mahesh and Rajashekar, 2021a). The study also noted that patients with elevated SGOT (93.8%) and SGPT (81.2%) had a higher incidence of bleeding manifestations.

In Bangladesh, a case report highlighted the occurrence of acute hepatitis in a patient with dengue hemorrhagic fever, emphasizing the potential severity of hepatic involvement in dengue infections (Weltgesundheitsorganisation, 1997).

Another study analyzing dengue cases in Dhaka between 2018 and 2022 reported that elevated liver enzymes (ALT and AST) were detected in 86.6% of severe dengue cases, along with hypoalbuminemia in 83.6% of cases (Rahim *et al.*, 2023).

Despite the clinical significance of liver involvement in dengue, few studies in Bangladesh have examined its correlation with disease severity. This study investigates the association between dengue severity and liver function in patients at a tertiary care hospital in Dhaka, aiming to enhance clinical management and inform better diagnostic and therapeutic strategies.

METHODS AND MATERIALS

Study Design, Site, and Duration

This cross-sectional observational study assessed the association between dengue severity and liver function among patients admitted to the Department of Medicine at Shaheed Suhrawardy Medical College Hospital, Dhaka. The study took place in this tertiary care hospital, located in the heart of Dhaka, Bangladesh, over six months, from July 2023 to December 2023.

Study Population

The study population consisted of patients admitted with dengue fever under the Department of Medicine at Shaheed Suhrawardy Medical College Hospital during the study period. A total of 130 eligible participants included adults aged 18 years or older who were diagnosed with dengue fever and provided informed consent to participate in the study. Pregnant patients, individuals with known liver diseases, chronic kidney disease, ischemic heart disease, or respiratory diseases, as well as those unwilling to participate, were excluded from the study.

Definition of Hepatitis: Hepatitis in dengue patients is defined as elevated liver enzyme levels, specifically ALT and/or AST exceeding the upper limit of the normal range per the hospital's laboratory reference. The normal range for SGOT (AST) is 5–40 U/L for men and 5–35 U/L for women, while for SGPT (ALT) it is 7–56 U/L for men and 5–40 U/L for women.

Data Analysis

The collected data were analyzed using SPSS version 25. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize socio-demographic characteristics, clinical variables, and liver function parameters. Inferential statistics were applied to examine associations between dengue severity and liver function. The Chi-square test or Fisher's exact test was used for categorical variables, while independent t-tests or Mann-Whitney U tests were performed for continuous variables, depending on the data distribution. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Shaheed Suhrawardy Medical College Hospital, Dhaka. Written informed consent was obtained from all participants, ensuring confidentiality. This approach ensured a robust framework for investigating the association between dengue severity and liver function.

RESULTS

The study included 130 dengue patients admitted to a tertiary care hospital in Dhaka, Bangladesh. The mean age of the patients was 29.7±11.1 years, with a range of 13–65 years. The majority of the patients were within the age groups of 21–30 years (40.0%) and 10–20 years (22.3%). Males accounted for 74.6% of the study population, while females comprised 25.4%.

Table 1: Patient Characteristics and Results

Variable	Mean value/Category	n	%
Age (Mean ± SD), years	**29.7±11.1**		
Age group (years)	10-20	29	22.3
	21-30	52	40.0
	31-40	26	20.0
	41-50	15	11.5
	51-60	8	6.2
Sex	Male	97	74.6
	Female	33	25.4
Clinical Presentation	Fever	130	100.0
	Vomiting	62	47.7
	Abdominal Pain	60	46.2
	Diarrhea	58	44.6
	Mucosal Bleeding	17	13.1
	Clinical Fluid Accumulation	35	26.9
	Shock	13	10.0
Dengue Severity	Without Warning Signs	18	13.8
	With Warning Signs	90	69.2
	Severe Dengue	22	16.9

Clinical presentations varied among the patients, although fever was universally present (100%). Gastrointestinal manifestations, including vomiting (47.7%), abdominal pain (46.2%), and diarrhea (44.6%), were common. Mucosal bleeding occurred in 13.1% of cases, and clinical fluid accumulation was observed in 26.9%. Notably, 10.0% of the patients developed shock.

In terms of dengue severity, 13.8% were diagnosed with dengue without warning signs, 69.2% with dengue with warning signs, and 16.9% with severe dengue. Elevated liver enzyme levels were prevalent among the study population. SGOT levels were elevated in 67.7% of patients, with a mean ±SD of 301.2±612.9 U/L and a median of 121.0 U/L. SGPT levels were elevated in 56.2% of patients, with a mean ±SD of 240.9±538.9 U/L and a median of 88.5 U/L (Table 1).

Table 2: Distribution of the study patients by liver function test of dengue patients (n=130)

Liver function test results	Mean/Median value/Category	n	%
SGOT (Mean ± SD)	301.2±612.9		
SGOT Median	121.0	88	67.7
SGOT	Elevated		
	Normal	42	32.3
SGPT (Mean ±SD)	240.9±538.9		
SGPT Median	88.5		
SGPT	Elevated	73	56.2
	Normal	57	43.8

The liver function test results for 130 dengue patients revealed that the median SGOT (AST) level was 121.0 U/L. Elevated SGOT levels were observed in 67.7% of patients, while 32.3% had normal levels. Similarly, the median SGPT (ALT) level was 88.5 U/L. Elevated SGPT levels were noted in 56.2% of patients, whereas 43.8% had normal levels. These findings suggest that a significant proportion of dengue patients experienced elevated liver enzyme levels, reflecting hepatic involvement (Table 2).

Table 3: Association of Dengue severity with elevated liver enzyme (n=130)

Liver function parameters	Dengue patients			p-value
	Without warning sign (n=18) n (%)	With warning sign (n=90) n (%)	Severe dengue (n=22) n (%)	
SGOT				
Elevated	4 (%22.2%)	64 (%71.1%)	20 (%90.9%)	
Normal	14 (%77.8%)	26 (%28.9%)	2 (%9.1%)	<0.001

SGPT				
Elevated	3 (%16.7%)	53 (%58.9%)	17 (%77.3%)	
Normal	15 (%83.3%)	37 (%41.1%)	5 (%22.7%)	<0.001

*p-value <0.05 considered as a level of significant

A significant association was observed between dengue severity and elevated liver enzyme levels ($p < 0.001$). Among patients with severe dengue, 90.9% exhibited elevated SGOT levels, compared to 71.1% of those with dengue with warning signs and 22.2% of those without warning signs. Similarly, elevated SGPT levels were found in 77.3% of severe dengue cases, 58.9% of patients with warning signs, and 16.7% without (Table 3).

DISCUSSION

The present study analyzed liver function abnormalities and their association with dengue severity among patients admitted to a tertiary care hospital in Dhaka, Bangladesh. The findings highlight significant demographic, clinical, and biochemical patterns that provide valuable insights into the spectrum of dengue infection and its hepatic involvement.

A notable observation was the predominance of younger age groups, with the majority of patients falling within 21–30 years (40.0%) and 10–20 years (22.3%). The mean age of the study population was 29.7 ± 11.1 years, with an age range of 13–65 years. This age distribution reflects the typical epidemiology of dengue, which often affects younger individuals due to their increased exposure to mosquito vectors or lifestyle-related factors. These results are consistent with findings, where young adults constituted the majority of dengue cases (Dinkar *et al*., 2023), for instance, reported a mean age of 33.90±15.82 years, with a high proportion (50.8%) of cases in the 18–30 years age group (Islam *et al*., no date).

Male patients represented 74.6% of the study population, indicating a significant gender disparity. This predominance may reflect gender-specific differences in exposure or healthcare-seeking behavior. Further investigation is required to understand the underlying social and behavioral factors contributing to this disparity.

Clinically, fever was universally present among all patients (100%), emphasizing its role as a hallmark of dengue infection. Gastrointestinal symptoms such as vomiting (47.7%), abdominal pain (46.2%), and diarrhea (44.6%) were also prevalent, suggesting the multisystemic nature of dengue. Critical complications, including clinical fluid accumulation (26.9%) and shock (10.0%), were noted, underscoring the potential for severe disease progression. These findings align with the previous study also documented high rates of fever, nausea/vomiting, and abdominal pain among dengue patients (Ramos-De La Medina *et al.*, 2011). Such symptoms, coupled with complications, highlight the importance of early diagnosis and management to mitigate severe outcomes.

Dengue severity classification revealed that the majority of patients (69.2%) presented with warning signs, followed by severe dengue (16.9%) and dengue without warning signs (13.8%). Compared to the existing study that reported 35% of patients with warning signs and 10% with severe dengue (Swamy, Mahesh and Rajashekar, 2021a), the higher proportions observed in the present study may reflect differences in referral patterns or disease burden in the Dhaka region.

A key finding was the significant association between dengue severity and elevated liver enzymes. Elevated SGOT and SGPT levels were observed in 67.7% and 56.2% of patients, respectively. Severe dengue cases demonstrated markedly higher percentages of elevated SGOT (90.9%) and SGPT (77.3%) compared to patients with warning signs or without warning signs ($p < 0.001$). These results align with studies conducted in India (Swamy, Mahesh and Rajashekar, 2021a). The greater rise in AST levels, as seen in both the present study and prior literature, suggests hepatic inflammation and possible muscle involvement.

Comparative analysis with other studies further supports the observed trends. For example, the previous study reported elevated SGOT and SGPT levels in 95% and 86% of patients, respectively, while another study demonstrated similar prevalence rates of elevated liver enzymes (Swamy, Mahesh and Rajashekar, 2021b), underscoring the association between liver dysfunction and disease severity. The variations in enzyme elevation across studies may stem from differences in patient populations, diagnostic criteria, and healthcare settings.

The significant correlation between elevated liver enzymes and dengue severity highlights the potential of SGOT and SGPT levels as biomarkers for identifying high-risk patients. Elevated aminotransferases in severe dengue may reflect direct viral damage to hepatocytes, immune-mediated hepatic injury, or hypoxia-induced ischemia during shock. These mechanisms underscore the need for routine liver function monitoring in dengue patients to facilitate early recognition of severe cases and guide management decisions.

Our study indicates that liver function abnormalities, as evidenced by elevated SGOT and SGPT levels, are common in dengue patients and are significantly associated with disease severity. This highlights the importance of monitoring liver function to assess and manage severe cases effectively.

This study also sheds light on regional differences in dengue epidemiology and clinical presentation. Compared to Swamy et al.,[10], who documented lower rates of severe dengue (10%) and liver enzyme elevation, the higher rates observed in this study may reflect the unique disease dynamics in Dhaka, a dengue-endemic region (Swamy, Mahesh and Rajashekar, 2021a; Khan *et al*., 2024). Additionally, the broader age range included in the present study (13–65 years) provides a more comprehensive understanding of the affected population compared to studies focusing primarily on young adults.

Despite its strengths, this study has limitations. The retrospective design may introduce selection bias, and the reliance on hospital records may lead to incomplete data. Additionally, the findings are based on a single tertiary care hospital, which may limit generalizability to other settings. Future studies should aim to include larger, multicenter cohorts and explore the long-term impact of liver dysfunction in dengue patients.

In conclusion, the present study highlights the significant prevalence of liver function abnormalities among dengue patients and their strong association with disease severity. Elevated SGOT and SGPT levels serve as potential biomarkers for severe dengue, warranting their inclusion in routine clinical evaluations. The findings underscore the importance of comprehensive patient assessment, including demographic, clinical, and biochemical parameters, for effective risk stratification and management of dengue infection. Further research is needed to elucidate the underlying mechanisms linking hepatic dysfunction to dengue severity and to explore therapeutic interventions targeting liver involvement.

CONCLUSION

This study highlights a significant association between dengue severity and liver dysfunction, as evidenced by elevated liver enzymes. Monitoring liver function in dengue patients is crucial for early detection and management of complications. Further research is needed to explore the underlying mechanisms and optimize clinical management strategies.

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