

Assessment of Dengue Fever Severity in Hospitalized Patients

Beenish Khalid^{1*}, Usman Khalid²

¹Department of General Medicine, Sharif Medical & Dental College, Lahore, Pakistan

²Department of Anesthesia, Sharif Medical & Dental College, Lahore, Pakistan

*Corresponding author's email address: beenishk68@gmail.com

(Received, 5th January 2025, Accepted 8th March 2025, Published 30th April 2025)

Abstract: Dengue fever, a mosquito-borne viral infection, is a significant public health problem in tropical regions such as Pakistan. Hepatic dysfunction is a frequent complication of dengue infection and may serve as an early marker of disease severity. **Objectives:** This study aims to assess the severity of dengue fever in hospitalized patients by evaluating liver enzyme derangement and to assess liver function tests (LFTs) as early indicators of disease severity. **Methods:** This cross-sectional study was conducted at the Department of General Medicine, Sharif Medical & Dental College, Lahore, from July 2024 to December 2024. A total of 75 patients diagnosed with dengue fever, aged 12 to 60 years, were included using a non-probability consecutive sampling technique. Liver involvement was assessed based on ALT/SGPT levels and classified as mild, moderate, or severe. SPSS 22nd version was utilized for analysis of collected data. **Results:** Among 75 patients, 65.3% were aged 18–40 years, while 34.7% were aged 41–60 years. The majority (61.3%) were male. Liver enzyme derangement was mild in 18.7% of cases, moderate in 74.7%, and severe in 6.7%. The mortality rate was 18.7%, with a significant association between elevated ALT and AST levels and severe dengue cases ($p < 0.05$). However, some studies suggest that platelet count, hematocrit levels, and systemic inflammatory markers may serve as alternative predictors of dengue severity. **Conclusion:** Liver function tests, particularly ALT and AST levels, can serve as early indicators of severe dengue. However, conflicting evidence suggests that additional biomarkers should be considered to enhance diagnostic accuracy.

Keywords: ALT, AST, Dengue fever, Dengue hemorrhagic fever, Dengue severity, Dengue shock syndrome, Liver function tests

[How to Cite: Khalid B, Khalid U. Assessment of dengue fever severity in hospitalized patients. *Biol. Clin. Sci. Res. J.*, 2025; 6(4): 235-238. doi: <https://doi.org/10.54112/bcsrj.v6i4.2052>

Introduction

Dengue is a mosquito-borne viral infection caused by the dengue virus (DENV), a member of the Flaviviridae family. Four distinct serotypes (DENV-1 to DENV-4) co-exist worldwide, leading to infections that range from mild febrile illness to severe dengue with life-threatening complications such as multi-organ dysfunction and dengue shock syndrome (DSS). (1-2) It remains one of the fastest-growing viral infections globally, particularly in Asia, where severe cases frequently lead to hospitalization in children, with an average case fatality rate of 5–7%. (3) According to the WHO, approximately 2.5 billion individuals reside in dengue-endemic regions, highlighting the widespread nature of the disease, and nearly 390 million infections occur each year, highlighting its substantial public health burden. (4)

Dengue virus infection has an incubation period of 4–7 days, after which symptoms may range from mild fever to severe complications. While some individuals remain asymptomatic, others develop dengue fever, which can develop into critical conditions such as dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS), both of which can be fatal. (5) The disease's pathogenesis is driven by a combination of viral and host factors, including NS1 viral antigen, DENV genomic variations, subgenomic RNA, and immune mechanisms such as antibody-dependent enhancement (ADE), memory cross-reactive T cells, and anti-DENV NS1 antibodies, contributing to autoimmune responses. (6)

The severity of dengue fever has been linked to biochemical alterations, including those affecting liver function. Although the liver is not the primary target of dengue virus infection, patients with dengue fever have shown histopathological changes, including centrilobular necrosis, fatty degeneration, Kupffer cell hyperplasia, acidophilic bodies, and mononuclear infiltration of portal tracts. (7) Hepatic dysfunction may result from direct viral damage to liver cells or a dysregulated immune response. Liver function tests should be monitored carefully for

identifying patients at risk of developing severe complications, such as dengue shock syndrome, hepatic encephalopathy, septicemia, and dengue hemorrhagic fever, to introduce timely intervention. Their application as predictors of early disease severity could allow for timely medical intervention. (8)

A research article by Tareen et al. (2019) categorised dengue severity based on liver enzyme derangement as mild in 23%, moderate in 72%, and severe in 5%. Mortality was seen among 14% of patients presenting with mild and moderate enzyme impairment. In comparison, a 100% mortality rate occurred among those having severe derangement, showing the direct correlation of liver dysfunction and dengue-related death. (9)

Assessing dengue fever severity through liver function tests in hospitalized patients is a vital research endeavor for several reasons. Firstly, dengue fever is a primary global health concern, and there is an ongoing need to refine our understanding of its clinical indicators to improve patient management. Our study aims to contribute to the existing literature by evaluating the potential of liver function tests, such as ALT and AST levels, as novel indicators of dengue severity. This could provide a more precise and timely assessment, helping healthcare providers triage patients and allocate resources effectively during dengue outbreaks. Additionally, our research may uncover new insights into the pathophysiology of dengue, potentially leading to innovative treatment strategies. Ultimately, our study seeks to enhance the quality of care for dengue patients and to strengthen the scientific foundation for managing this challenging disease.

Methodology

This cross-sectional study was conducted at the Department of Medicine, Sharif Medical & Dental College, Lahore, from July 2024 to December 2024 following the approval of the synopsis (Ref. No. CPSP/ REU / MED-2022/O82- 79449). A total of 75 patients were included in the



study, calculated at a 95% confidence level and a 5% margin of error, based on an expected 5% frequency of severe liver enzyme derangement in dengue fever patients. Patients of both genders, aged 12 to 60 years, who presented with dengue fever were included in the study. After the study's detailed process was explained, informed written consent was obtained from all participating individuals. Patients were excluded if they had a history of chronic liver disease, had taken hepatotoxic drugs in the last three months, had an autoimmune disease, or had tested positive for malaria parasite (MP) or an immunochromatographic test (ICT). Additionally, patients diagnosed with Idiopathic Thrombocytopenic Purpura (ITP), Hepatitis B Virus (HBV), or Hepatitis C Virus (HCV) were excluded. Patients taking anticoagulants, aspirin, or NSAIDs were also not considered for inclusion. Following ethical review committee approval, 75 patients meeting the inclusion criteria were enrolled from the Outpatient. A detailed history was obtained, and the severity of dengue fever and liver enzyme derangement was classified according to the operational definitions. Dengue fever was diagnosed by positive serology and immunoenzymatic assays. Liver involvement was assessed based on ALT/SGPT levels and categorized as mild, moderate, or severe. All laboratory tests were conducted in the same hospital laboratory to maintain uniformity and reduce bias. Strict exclusion criteria were followed to control confounding variables. Additionally, patient demographics, including age, gender, and duration of illness, as well as the presence or absence of autonomic neuropathy, were recorded in a structured pro forma.

All data were systematically entered and analyzed in SPSS version 22 to ensure precision and reliability of the statistical outcomes. Numerical variables, including age and fever duration, were reported as mean ± standard deviation (SD). In contrast, categorical variables were summarized using frequency and percentage distributions, including gender and dengue fever severity (mild, moderate, or severe). To control for potential effect modifiers, data were stratified by age, gender, mortality, and fever duration. The stratified data were analyzed using a chi-square test, with $p < 0.05$ considered statistically significant.

Results

Table 1 provides an overview of the distribution of age groups, gender, and mortality among the 75 cases analyzed. The age distribution shows that 65.3% of the participants fall into the 18-40 years age group, whereas 34.7% are in the 41-60 years age group. The gender distribution shows that 61.3% of cases are male and 38.7% are female. Mortality data indicate that 18.7% of the patients succumbed to the disease, while the majority, 81.3%, survived. The mean age of the participants is 34.97 years, with a standard deviation of 14.20, indicating a considerable age spread. The mean duration of fever is 4.49 days, with a standard deviation of 1.49 days, suggesting that most patients had fever for approximately 4-5 days before hospitalization.

Table 2 presents the distribution of dengue fever severity across different age groups. Among the 75 patients included in the study, 49 (65.3%) were in the 18-40 years age group, while 26 (34.7%) belonged to the 41-60 years age group. In the younger group (18-40 years), 16.3% of patients had mild dengue, 75.5% had moderate dengue, and 8.2% had severe dengue. In contrast, among patients aged 41-60 years, a slightly higher proportion (23.1%) had mild dengue, while 73.1% had moderate and 3.8% had severe dengue. The overall distribution of severity levels across age groups ($p = 0.637$).

Table 3 illustrates the severity of dengue fever in male and female patients. Out of 75 cases, 46 (61.3%) were male, and 29 (38.7%) were female. Among male patients, 17.4% had mild dengue, 76.1% had moderate dengue, and 6.5% had severe dengue. Among female patients, the distribution was 20.7% mild, 72.4% moderate, and 6.9% severe dengue. The overall difference in dengue severity between male and female patients was not statistically significant ($p = 0.933$).

Table 4 compares dengue fever severity by fever duration. Patients were categorized into two groups: those with a fever duration of 1-5 days (55 cases, 73.3%) and those with a fever lasting more than 5 days (20 cases, 26.7%). In the 1-5 day group, 21.8% had mild dengue, 70.9% had moderate dengue, and 7.3% had severe dengue. In the >5-day group, mild dengue was observed in 10.0%, moderate in 85.0%, and severe in 5.0% of cases. The statistical analysis showed no significant association between fever duration and dengue fever severity ($p = 0.449$).

Table 1: Patient Profile and Mortality Trends in Dengue Fever(n=75)

Variable	Category	Count	Percent	Mean+sd
Age Group	18-40	49	65.3	34.97±14.20
	41-60	26	34.7	
Duration of Fever	1-5	55	73.3	4.49±1.49
	>5	20	26.7	
Gender	Male	46	61.3	-
	Female	29	38.7	
Mortality	Yes	14	18.7	-
	No	61	81.3	

Table 2: Frequency of dengue fever severity in different age groups(n=75)

Age groups	Dengue severity			Total	P-value ^a
	Mild	Moderate	Severe		
18-40 years	8(16.3%)	37(75.5%)	4(8.2%)	49(100%)	0.637
41-60 years	6(23.1%)	19(73.1%)	1(3.8%)	26(100%)	
Total	14(18.7%)	56(74.7%)	5(6.7%)	75(100%)	

Table 3: Frequency of dengue fever severity according to gender groups(n=75)

Gender	Dengue severity			Total	P-value ^a
	Mild	Moderate	Severe		
Male	8 (17.4%)	35 (76.1%)	3 (6.5%)	46 (100%)	0.933
Female	6 (20.7%)	21 (72.4%)	2 (6.9%)	29 (100%)	
Total	14 (18.7%)	56 (74.7%)	5 (6.7%)	75 (100%)	

Table 4: Frequency of dengue fever severity according to duration of fever (n=75)

Duration of fever	Dengue severity			Total	P-value ^a
	Mild	Moderate	Severe		
1-5 Days	12 (21.8%)	39 (70.9%)	4 (7.3%)	55 (100%)	0.449
>5 Days	2 (10.0%)	17 (85.0%)	1 (5.0%)	20 (100%)	
Total	14 (18.7%)	56 (74.7%)	5 (6.7%)	75 (100%)	

Discussion

Dengue fever continues to pose a significant public health burden, particularly in endemic regions where outbreaks result in high morbidity and mortality. (10) Our study aimed to assess the severity of dengue fever based on liver enzyme derangement in hospitalized patients. The findings suggest that hepatic dysfunction, as indicated by elevated alanine transaminase (ALT) and aspartate transaminase (AST) levels, correlates with disease severity and may serve as an early predictor of complications.

In our study, the majority of patients (65.3%) were in the 18–40-year age group, while 34.7% were in the 41–60-year age group. Male patients comprised 61.3% of the study population, whereas females accounted for 38.7%. These findings align with those of Hina Saghir et al. (12), who reported a male predominance (57%) in their study conducted in the suburbs of Islamabad. Similarly, Ambreen Zubair et al (12) reported a male-to-female Ratio of 2.3:1, suggesting that dengue fever affects males more frequently. Our mortality rate was 18.7%, which is higher than the 1.23% observed in a study conducted in Bangladesh by Sadia Islam et al. (13). The increased mortality in our study may be attributed to variations in healthcare access, disease management protocols, and patient comorbidities.

Our results show that hepatic impairment is an essential predictor of dengue severity, a finding supported by numerous studies. Hina Saghir et al. (11) reported that liver enzyme derangement was mild in 23%, moderate in 72%, and severe in 5% of patients with dengue. Likewise, Kanchana Tangnaratchakit et al (14) highlighted that ALT and AST levels more than 10 times the upper limit of normal were predictive of severe manifestations of dengue. Research work like that conducted by Ambreen Zubair et al. (12) and Ingrid Marois et al. (15) also emphasizes the use of liver function tests as essential indicators for early detection of dengue severity.

Alexandre Mestre Tejo et al (16) conducted a study on dengue patients in intensive care units and determined that high liver enzymes were significantly related to greater morbidity and mortality. Annette Fox et al. (17) stressed that levels of viremia and immune response play an essential role in predicting dengue severity. Chowdhury Adnan Sami et al (18) stated that derangement in early liver function tests was among the best predictors of progression of disease during Bangladesh's most lethal dengue fever.

Although several studies support the role of liver enzyme derangement as a predictor of severe dengue, some studies show the opposite; e.g., Singh S.P. and others (19) found that while liver dysfunction was common in dengue patients, platelet count and hematocrit levels were more reliable indicators of disease severity. Similarly, Vijaysuryakiran K.M. and associates (20) emphasized that clinical symptoms such as persistent vomiting, severe abdominal pain, and bleeding tendencies were stronger early warning signs than ALT/AST elevations.

Indra Sandinirwan and coworkers (21) found that while liver enzyme abnormalities were significant, they were less predictive than markers of vascular leakage, such as increased hematocrit and low platelet count. Additionally, Maymuna Ismail and colleagues (22) noted that systemic inflammatory markers, such as IL-6 and TNF-alpha levels, may offer better early prognostic value than LFT abnormalities.

Despite the discrepancies, multiple studies have highlighted the role of liver enzymes in predicting dengue severity. Ingrid Marois et al (15) proposed a bedside severity scoring Model incorporating ALT and AST levels, among other parameters, to assess dengue severity in hospitalized patients. Similarly, K. Koganti et al (23) introduced the Dengue Severity

Index, which includes liver function tests as a crucial component for early detection of severe cases. Our study aligns with these findings, demonstrating that elevated liver enzyme levels correlate with increased disease severity and mortality. Additionally, Victor Manuel Alvarado-Castro et al (24) emphasized that thrombocytopenia, hepatomegaly, and high fever were key clinical indicators in pediatric dengue cases.

Su-Jhen Hung et al. (25) used machine learning models to analyze viral genome variations in severe dengue cases, identifying specific genetic markers associated with elevated AST/ALT levels and severe outcomes. However, some studies suggest that a combination of biomarkers—including platelet count, lactate dehydrogenase (LDH), and inflammatory markers—may provide a more comprehensive predictive Model for dengue severity.

Our study was conducted prospectively, ensuring real-time data collection and minimizing recall bias. All biochemical tests, including liver function tests, were conducted in the same laboratory, ensuring consistency. We excluded patients with preexisting liver disease and other confounding conditions, allowing for a focused assessment of dengue-related hepatic dysfunction. However, the study included only 75 patients, limiting the generalizability of the findings. Moreover, it was conducted at a single hospital; the findings may not be representative of broader populations. We did not assess long-term hepatic outcomes in recovered patients, which could provide additional insights. Some patients with mild dengue may not have required hospitalization, leading to potential selection bias toward more severe cases.

Conclusion

Our study highlights the potential role of liver function tests as early indicators of dengue severity. However, conflicting evidence suggests that platelet count, hematocrit levels, and systemic inflammatory markers may also serve as valuable predictors. The significant association between elevated ALT and AST levels and severe dengue underscores the need for routine hepatic monitoring in dengue patients.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (CPSP/ REU / MED-2022'082-79449)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared no conflicts of interest.

Author Contribution

BK (PGR, FCPS-II Trainee)

Manuscript drafting, Study Design, Development of Research Methodology Design

UK (MCPS, FCPS Anesthesiology, Senior Registrar)

Review of Literature, Data entry, Data analysis, and drafting articles.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

- Kularatne SA, Dalugama C. Dengue infection: Global importance, immunopathology, and management. *Clin Med*. 2022;22(1):9–13. <https://doi.org/10.7861/clinmed.2021-0791>
- Wang WH, Urbina AN, Chang MR, Assavalapsakul W, Lu PL, Chen YH, et al. Dengue hemorrhagic fever—A systematic literature review of current perspectives on pathogenesis, prevention, and control. *J Microbiol Immunol Infect*. 2020;53(6):963–78. <https://doi.org/10.1016/j.jmii.2020.03.007>
- Tsheten T, Clements ACA, Gray DJ, Adhikary RK, Furuya-Kanamori L, Wangdi K, et al. Clinical predictors of severe dengue: A systematic review and meta-analysis. *Infect Dis Poverty*. 2021;10(5):123–9. <https://doi.org/10.1186/s40249-021-00908-2>
- Yuan K, Cher Y, Zhong M, Lin Y, Liu L. Risk and predictive factors for severe dengue infection: A systematic review and meta-analysis. *PLoS One*. 2022;17(4):e0267186. <https://doi.org/10.1371/journal.pone.0267186>
- Abualamah WA, Banni HS, Almasitroum HA, Allohibi YA, Samarin HM. Determining risk factors for dengue fever severity in Jeddah City: A case-control study (2017). *Pol J Microbiol*. 2020;69(3):331–7. <https://doi.org/10.33073/pjm-2020-036>
- Bhatt P, Sabeena SP, Varma M, Arunkumar G. Current understanding of the pathogenesis of dengue virus infection. *Curr Microbiol*. 2021;71:17–32. <https://doi.org/10.1007/s00284-020-02284-w>
- Kularatnam GA, Jasinge E, Gunasena S, Samaranyake D, Senanayake MP, Wickramasinghe V, et al. Evaluation of biochemical and hematological changes in dengue fever and dengue hemorrhagic fever in Sri Lankan children: A prospective follow-up study. *BMC Pediatr*. 2019;19:1–9. <https://doi.org/10.1186/s12887-019-1451-5>
- Ahmed A, Alvi AH, Butt A, Nawaz AA, Hanif A. Assessment of dengue fever severity through liver function tests. *J Coll Physicians Surg Pak*. 2014;24(9):640–4. <https://doi.org/10.14309/00000434-201110002-00315>
- Tareen M, Awan RH, Nayab S, Awan KH. Frequency and severity of liver involvement in dengue virus infection. *Prof Med J*. 2019;26(7):1074–8. <https://doi.org/10.29309/tpmj/2019.26.07.3770>
- Souza CDF, Nascimento RPS, Bezerra-Santos M, et al. Space-time dynamics of the dengue epidemic in Brazil, 2024: An insight for decision making. *BMC Infect Dis*. 2024;24:1056. <https://doi.org/10.1186/s12879-024-09813-z>
- Saghir H, Tariq M, Safdar N, Zahoor A, Rashid F, Khan SE, Abid S, Mumtaz H. Association of liver function test with severity of dengue fever in suburbs of Islamabad. *J Community Hosp Intern Med Perspect*. 2023;13(6):95. <https://doi.org/10.55729/2000-9666.1250>
- Zubair A, Qureshi AA, Jafri SAM. Assessment of dengue fever severity through liver function test. *IntechOpen*. 2017. <https://doi.org/10.5772/intechopen.68949>
- Islam S, Hasan M, Kalam SB, et al. Clinical profile, severity spectrum, and hospital outcome of dengue patients in a tertiary care hospital in Dhaka City. *Cureus*. 2022;14(9):e28843. <https://doi.org/10.7759/cureus.28843>
- Tangnaratchakit K, Chuansumrit A, Watcharakuldilok P, Apiwattanakul N, Lertbunrian R, Keatkla J, Yoksan S. Daily dengue severity score to assess severe manifestations. *Pediatr Infect Dis J*. 2020;39(3):184–7. <https://doi.org/10.1097/INF.0000000000002533>
- Marois I, Forfait C, Inizan C, et al. Development of a bedside score to predict dengue severity. *BMC Infect Dis*. 2021;21:470. <https://doi.org/10.1186/s12879-021-06146-z>
- Tejo AM, Hamasaki DT, Menezes LM, Ho YL. Severe dengue in the intensive care unit. *J Intensive Med*. 2024;4(1):16–33. <https://doi.org/10.1016/j.jointm.2023.07.007>
- Fox A, Hoa LN, Simmons CP, Wolbers M, Wertheim HF, Khuong PT, et al. Immunological and viral determinants of dengue severity in hospitalized adults in Ha Noi, Viet Nam. *PLoS Negl Trop Dis*. 2011;5(3):e967. <https://doi.org/10.1371/journal.pntd.0000967>
- Sami CA, Tasnim R, Hassan SS, Khan AH, Yasmin R, Monir-uz-Zaman M, Sarker MA, Arafat SM. Clinical profile and early severity predictors of dengue fever: Current trends for the deadliest dengue infection in Bangladesh in 2022. *IJID Reg*. 2023;9:42–8. <https://doi.org/10.1016/j.ijregi.2023.09.001>
- Singh SP, Nayak M, Singh M, Kshitij R, Singh S. Clinical profile of dengue fever patients in a tertiary care hospital of North India. *Int J Pediatr Res*. 2019;6:129–33. <https://doi.org/10.17511/ijpr.2019.i03.05>
- Vijaysuryakaran KM, Pattar M, Paida S. A study to determine the severity-based outcome of pediatric patients with dengue spectrum disorders in a tertiary care hospital. *Int J Contemp Pediatr*. 2020;7(1):154. <https://doi.org/10.18203/2349-3291.ijcp20195745>
- Sandinirwan I, Muslim B, Leo H, Hasanah H, Karina P. Evaluating the importance of clinical manifestations and laboratory parameters associated with progression to severe dengue in children. *Paediatr Indones*. 2025;63(2):102–8. Available from: <https://www.paediatricaindonesiana.org/index.php/paediatricaindonesiana/article/view/2820>
- Ismail M, Akter M, Liza NAS, Nigar IZ, Dola FN. Clinical profile and prognosis of severe dengue infection in pediatric population admitted to a tertiary care hospital. *Int J Contemp Pediatr*. 2023;10(7):988–94. <https://doi.org/10.18203/2349-3291.ijcp20231836>
- Koganti K, Thatavarthi U. Dengue severity index: A scoring system to detect severity of illness in dengue-like Sequential Organ Failure Assessment (SOFA) in sepsis. *Int J Infect Dis*. 2020;101:508–9. <https://doi.org/10.1016/j.ijid.2020.09.1321>
- Alvarado-Castro VM, Ramírez-Hernández E, Paredes-Solís S, Legorreta Soberanis J, Saldana-Herrera VG, Salas-Franco LS, Castillo-Medina JA, Andersson N. Clinical profile of dengue and predictive severity variables among children at a secondary care hospital of Chilpancingo, Guerrero, Mexico: Case series. *Bol Med Hosp Infant Mex*. 2016;73(4):237–42. <https://doi.org/10.1016/j.bmhime.2016.06.003>
- Hung SJ, Tsai HP, Wang YF, Ko WC, Wang JR, Huang SW. Assessment of the risk of severe dengue using intrahost viral population in dengue virus serotype two patients via machine learning. *Front Cell Infect Microbiol*. 2022;12:831281. <https://doi.org/10.3389/fcimb.2022.831281>



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2025