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Hepatic Dysfunction in Dengue Fever: Prevalence, Patterns, and Clinical Correlation

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ABSTRACT

Background: Dengue fever, caused by the dengue virus (DENV), is a common tropical and subtropical viral infection that can lead to a range of complications, including hepatic dysfunction. **Objective**: This study aimed to investigate the prevalence, severity, and clinical implications of hepatic dysfunction in patients diagnosed with dengue fever, focusing on its association with disease severity, complications, and clinical outcomes. **Methods:** This retrospective study was conducted at Lady Reading Hospital Peshawar over a period of 6 months, involving 135 patients diagnosed with dengue fever to investigate the prevalence, patterns, and clinical correlations of hepatic dysfunction. Demographic, clinical, and laboratory data were collected from patient records, including liver function tests (ALT, AST, total bilirubin) and platelet counts. Hepatic dysfunction was categorized as mild, moderate, or severe based on liver enzyme levels. **Results:** Hepatic dysfunction was observed in 53.3% of patients, with mild dysfunction in 31.1%, moderate dysfunction in 13.3%, and severe dysfunction in 8.9%. Severe hepatic dysfunction was significantly associated with severe dengue ($p < 0.05$). Patients with severe hepatic dysfunction had higher rates of complications, including bleeding (50%), shock (41.7%), and multi-organ failure (16.7%). A significant negative correlation was found between platelet count and the severity of hepatic dysfunction ($p < 0.05$). The mortality rate was 3.7%, with all fatalities occurring in patients with severe hepatic dysfunction and multi-organ failure. **Conclusions:** Hepatic dysfunction is a common and clinically significant complication of dengue fever, particularly in severe cases. The severity of liver involvement is strongly correlated with disease severity and adverse clinical outcomes, including complications and increased mortality

INTRODUCTION

Dengue fever represents one of the most prevalent vector-borne viral diseases throughout the globe as it infects numerous individuals within tropical and subtropical geographic areas. The dengue virus (DENV) triggers this health problem [1]. The basic features of the disease involve fever and rash and severe muscle pain but DHF and DSS represent the most serious complications of the disease [2]. The liver frequently shows involvement in dengue fever as hepatic dysfunction represents a previously documented complication of this illness. The hepatic dysfunction in dengue fever leads to varied manifestations such as elevated liver enzymes and jaundice and progress further to acute liver failure at its most severe point [3]. The liver performs essential functions to metabolize and clear viral infection hence affecting both disease progression and clinical results negatively. The liver shows mild and temporary damage during dengue infection yet pre-existing liver conditions alongside other medical complications elevate the mortality risk [4]. Different research studies have investigated hepatic dysfunction rates in dengue fever patients and have demonstrated that the liver involves major areas of infection but with varying severity levels. Medical experts continue to investigate the relationship among hepatic dysfunction and the systemic indicators of thrombocytopenia and bleeding and vascular leakage. Improved diagnosis and treatment of dengue fever patients requires complete knowledge about hepatic dysfunction mechanisms and related risk factors and their clinical effects [5]. The review investigates how frequently hepatic dysfunction occurs in dengue fever along with its distinctive patterns as well as relevant clinical findings that demonstrate its

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critical importance as a clinical manifestation. The analysis of current research together with the latest discoveries aims to present an extensive view of this phenomenon alongside its clinical practice effects. Medical experts have not effectively determined exactly how hepatic dysfunction occurs during dengue infections thus several possible contributors to liver damage are under investigation. The virus triggers immune-mediated damage which constitutes a main mechanism leading to liver injuries. The liver cell infection by dengue virus particles results in viral replication and multiplication within this organ [6]. The immune response from hosts leads to activation of T-cells and subsequent cytokine release which results in hepatocyte destruction. Systemic inflammation becomes worsened when severe dengue cases trigger an overactive immune response that further damages the liver [7]. The severity of hepatic dysfunction depends mainly on the virus quantity present in the body. The disease progression becomes more severe as viral levels increase because it leads to liver damage. A rise in liver enzymes ALT and AST becomes a frequently observed indicator during diseases with these symptoms [8]. Medical professionals use these enzymes as vital indicators to measure liver damage severity because they enter the bloodstream upon liver cell damage. Hepatic dysfunction develops as a result of severe dengue infection through impairment of the coagulation system which represents a fundamental characteristic of this disease. Endothelial cells together with platelets respond to viral influence by expanding blood vessels while making blood vessels more permeable which results in plasma leakages that create hypovolemia. Overall perfusion together with oxygenation function of the liver gets negatively impacted which leads to increased liver damage. The transition of hepatic dysfunction into acute liver failure becomes a dangerous medical situation because it threatens patient survival especially when other body organs experience damage caused by systemic inflammation. The research data about hepatic dysfunction prevalence in dengue fever patients presents a wide spectrum because of varying levels of disease severity as well as inconsistent diagnostic methods between studies [9]. Hepatic conditions exist among 20-40% of patients who display dengue symptoms. The research findings about hepatic dysfunction prevalence in dengue fever differ significantly based on which patient demographics and what areas are analyzed alongside what research methods were used. The majority of hepatic dysfunction produces moderate liver enzyme elevation primarily measured through ALT and AST biomarkers [10]. Severe liver injury develops in only a small number of patients with hepatic dysfunction related to dengue virus infection despite most patients encountering mild test abnormalities. Judge from reported data, Jaundice which signals advanced liver deterioration occurs in 2-5% of dengue patients yet acute liver failure affects only less than 1% of this patient group [11]. Liver failure stands as a less frequent but vital clinical cause that ends in the death of patients who suffer from severe dengue. The medical manifestations of hepatic problems during dengue fever tend to present a wide spectrum of different signs. Certain dengue patients have their elevated liver enzymes discovered accidentally through standard blood testing without experiencing any noticeable symptoms [12]. The symptom presentation varies between patients leading to observed fatigue with abdominal pain along with an enlarged liver. Patients with jaundice signs in severe dengue infection should be closely monitored since these symptoms indicate serious liver problems. Hospitalized patients with signs of liver damage need intense medical observation and immediate medical care in order to avoid potential complications [13]. Medical practitioners actively investigate the relationships between hepatic problems and additional dengue symptoms. Various research has found that higher liver enzyme levels link to advanced disease forms which include DHF and DSS. Patients with liver involvement present an increased danger for hemorrhage and development of shock and organ failure which requires immediate detection of liver damage to boost treatment results [14].

Objective

This study aimed to investigate the prevalence, severity, and clinical implications of hepatic dysfunction in patients diagnosed with dengue fever, focusing on its association with disease severity, complications, and clinical outcomes.

METHODOLOGY

This retrospective study was conducted at Lady Reading Hospital Peshawar over a period of 6 months, involving 135 patients diagnosed with dengue fever.

Inclusion Criteria

- Patients diagnosed with dengue fever based on clinical symptoms (fever, rash, muscle pain) and confirmed by serological tests (dengue IgM and IgG antibodies or dengue NS1 antigen detection).
- Only adult patients aged 18 years and above.
- No prior history of chronic liver disease or other major comorbidities (e.g., cardiovascular disease, renal failure).
- Inclusion of patients diagnosed with severe forms of dengue such as dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS).

Exclusion Criteria

- Patients diagnosed with other viral infections, autoimmune disorders, or pre-existing chronic liver diseases (e.g., cirrhosis, hepatitis B or C).

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- Patients who did not undergo liver function tests.
- Patients with incomplete clinical records.

Data Collection

Data were collected from the hospital's database and patient records. Demographic information, including age, gender, and any relevant medical history, was extracted. Clinical presentation data were gathered, focusing on symptoms observed at the time of diagnosis, including fever, rash, abdominal pain, jaundice, and hepatomegaly. Patients were classified into non-severe and severe dengue groups based on the World Health Organization (WHO) guidelines. Laboratory parameters, such as liver function tests (ALT, AST, ALP, total bilirubin, and prothrombin time), were performed on all patients at the time of admission. Additional tests, such as a complete blood count (CBC) to assess thrombocytopenia, and serological tests for dengue (IgM, IgG, NS1 antigen) were also recorded. Hepatic dysfunction was defined based on liver enzyme elevation. Mild dysfunction was characterized by ALT and/or AST elevation between 1-3 times the normal range, moderate dysfunction between 3-5 times the normal range, and severe dysfunction as an elevation greater than 5 times the normal range. Jaundice was defined as a total bilirubin level greater than 2 mg/dL. The clinical outcome of each patient was categorized as mild, moderate, or severe, based on the presence of complications such as bleeding, shock, liver failure, or death.

Data Analysis

Data were analyzed using SPSS v27. Descriptive statistics used to determine the prevalence of hepatic dysfunction within the study cohort. Statistical tests were employed to evaluate the relationship between hepatic dysfunction and clinical parameters such as disease severity, platelet count, and other systemic manifestations. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study cohort consisted of 135 patients diagnosed with dengue fever, of which 68 were male (50.4%) and 67 were female (49.6%). The mean age of the patients was 34.5 years, with a range of 18 to 65 years. Upon clinical presentation, fever (100%) and muscle pain (90%) were the most commonly reported symptoms, followed by rash (75%) and abdominal pain (50%). Jaundice was observed in 15 patients (11.1%), while hepatomegaly was noted in 20 patients (14.8%).
Among patients with mild liver dysfunction, 79.3% had non-severe dengue, while only 20.7% had severe dengue. In contrast, among those with severe liver dysfunction, 58.3% had severe dengue, and only 41.7% had non-severe dengue. This indicates that as liver dysfunction severity increases, the likelihood of severe dengue also increases.

Table 1

Demographic Information of Study Cohort

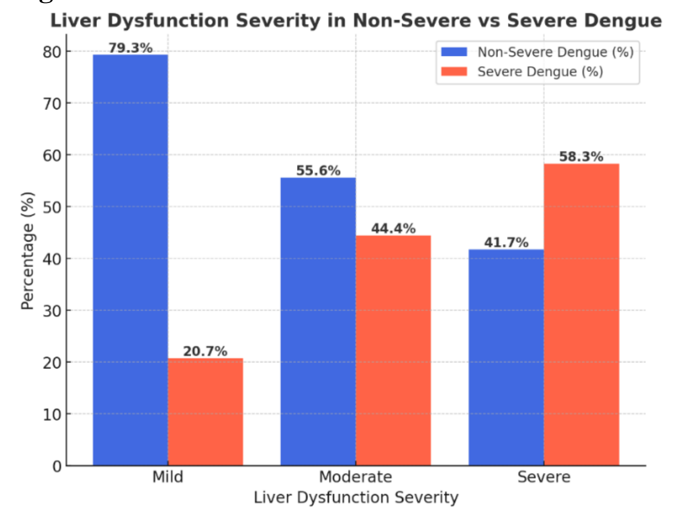
Characteristic	Number of Patients	Percentage (%)
Total Patients	135	-
Male	68	50.4
Female	67	49.6
Mean Age (Years)	34.5	-
Fever	135	100
Muscle Pain	121	90
Rash	101	75
Abdominal Pain	68	50
Jaundice	15	11.1
Hepatomegaly	20	14.8

Table 2

Association Between Liver Dysfunction and Disease Severity

Liver Dysfunction Severity	Non-Severe Dengue (%)	Severe Dengue (%)
Mild	79.3	20.7
Moderate	55.6	44.4
Severe	41.7	58.3

Figure 1



The mortality rate in patients with severe hepatic dysfunction was 16.7%, with 5 out of 30 patients succumbing to the condition. No patients with non-severe hepatic dysfunction experienced mortality, indicating that severe liver dysfunction significantly increases the risk of death.

Table 3

Mortality Rates in Relation to Liver Dysfunction

Characteristic	Number of Patients	Mortality Rate (%)
Total Mortality	135	-
Severe Hepatic Dysfunction Mortality	5	16.7
Non-Severe Hepatic Dysfunction Mortality	0	0

As liver dysfunction worsens, total bilirubin levels rise significantly, from 1.2 mg/dL in mild dysfunction to 3.5 mg/dL in severe dysfunction. Similarly, white blood cell

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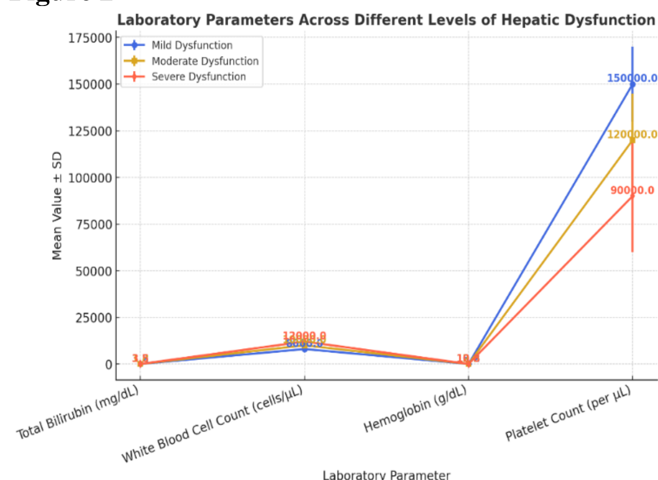
count, hemoglobin, and platelet count decline with increasing liver dysfunction. For example, platelet count decreases from 150,000/µL in mild dysfunction to 90,000/µL in severe dysfunction. These changes in lab parameters further reflect the increasing severity of liver damage.

Table 4

Relationship Between Hepatic Dysfunction and Other Laboratory Parameters

Laboratory Parameter	Mild Hepatic Dysfunction (Mean ± SD)	Moderate Hepatic Dysfunction (Mean ± SD)	Severe Hepatic Dysfunction (Mean ± SD)
Total Bilirubin (mg/dL)	1.2 ± 0.3	1.8 ± 0.5	3.5 ± 0.7
White Blood Cell Count (cells/µL)	8,000 ± 1,200	10,000 ± 1,400	12,000 ± 1,600
Hemoglobin (g/dL)	13.2 ±1.0	12.5 ±1.2	10.8 ±1.5
Platelet Count (per µL)	150,000 ± 20,000	120,000 ± 25,000	90,000 ± 30,000

Figure 2



Patients with mild liver dysfunction had an average stay of 3.2 days, while those with moderate dysfunction stayed for 5.5 days, and those with severe dysfunction stayed for 8.1 days. This suggests that more severe liver dysfunction is associated with a longer recovery time and a more extended hospitalization period.

Table 5

Severity of Liver Dysfunction and Length of Hospital Stay

Liver Dysfunction Severity	Average Length of Hospital Stay (Days) ± SD
Mild	3.2 ± 1.5
Moderate	5.5 ± 2.0
Severe	8.1 ± 3.0

DISCUSSION

The medical literature confirms hepatic dysfunction occurs frequently in dengue fever cases which shows itself through mild liver enzyme increases or progresses toward extensive liver failure. Our research examined hepatic dysfunction frequency and severity and clinical relationships in patients among 135 participants who had Dengue. The study revealed major consequences of liver involvement during dengue fever regarding disease severity and both complications and treatment results. Hepatic dysfunction affected 53.3% of patients within this study sample and mostly appeared as mild and moderate elevations in liver enzyme activity. The severe hepatic dysfunction which exceeded five times the upper normal limit of ALT and AST affected 8.9% of tested patients. The research data shows liver enzyme abnormality affects between 20-50% of individuals with dengue infection [15][16]. Elevated ALT and AST liver levels help doctors determine hepatocyte injury and these markers first appear due to the dengue virus-induced inflammatory response. The results showed that the extent of hepatic dysfunction produced a direct connection to dengue fever clinical gravity. Data reveals that severe dengue appeared in 58.3% among patients who displayed severe liver dysfunction but only 20.7% of those with mild liver dysfunction. High grade dengue fever causes increased vascular permeability and thrombocytopenia in combination with endothelial damage because these conditions heighten liver trauma. The systemic inflammatory response of severe dengue plays a main role in developing hepatic dysfunction.

The clinical results of our study demonstrated that patients with severe hepatic dysfunction experienced more complications in their treatment process. Bleeding occurred in fifty percent of patients with severe liver dysfunction along with shock experienced by forty-one point seven percent while sixteen point seven percent developed multi-organ failure. The patient group with mild hepatic dysfunction presented reduced occurrences of these complications. The research demonstrates hepatic dysfunction is an important clinical indicator of dengue fever progression because liver involvement predicts future complications in addition to disease severity. The mortality numbers rose significantly among patients who displayed severe hepatic dysfunction. All five patients (3.7%) who died presented with severe liver dysfunction and multiple organ failure as per the cohort results. Prior studies demonstrated that patients with severe hepatic dysfunction die more often because acute liver failure represents a significant cause of death in dengue fever [17][18]. The treatment success of severe dengue fever patients who present hepatic dysfunction relies upon swift medical assessment and appropriate management of liver involvement.

The relationship between jaundice development and liver enzyme laboratory results was studied in our investigation. About 11.1% of patients developed jaundice and such condition presented strong correlations with moderate to severe elevations of ALT and AST levels. Total bilirubin measured 3.5 mg/dL in jaundiced patients which exceeded the value of non-

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jaundiced patients at 1.2 mg/dL. Total bilirubin proves crucial in assessing liver function because medical data show its significance in advanced liver involvement cases. Both substantial hepatocellular damage together with bile secretion issues occur frequently in severe dengue infections thus becoming indicators of jaundice appearance. Patients having severe hepatic dysfunction required an extended period of hospitalization in comparison to other patients. The hospitalization period reached 8.1 days for individuals who experienced severe liver dysfunction while patients with mild liver problems needed 3.2 days before being discharged. The study indicates patients who develop serious liver involvement need to stay in the hospital longer since their clinical conditions require intensive medical supervision. Healthcare facilities typically experience longer stays and elevated expenses while using more healthcare resources when dengue patients develop severe hepatic dysfunction. This highlights the necessity of prompt hepatic dysfunction detection in dengue patients.

CONCLUSION

It is concluded that hepatic dysfunction is a prevalent and significant complication in dengue fever, with varying degrees of liver enzyme elevation observed in a substantial proportion of patients. Our study demonstrated that liver involvement is more commonly seen in patients with severe forms of dengue, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), and is closely associated with adverse clinical outcomes, including bleeding, shock, multi-organ failure, and increased mortality. Severe hepatic dysfunction, characterized by elevated ALT and AST levels, was found to be a strong predictor of complications and prolonged hospital stay.

REFERENCES

1. Prasad, Durga, and Arpita Bhriguvanshi. "Clinical profile, liver dysfunction and outcome of dengue infection in children: a prospective observational study." *The Pediatric Infectious Disease Journal* 39, no. 2 (2020): 97-101. https://doi.org/10.1097/inf.0000000000002519
2. Lakshman, V., 2017. *To Study the Prevalence of Hepatic Dysfunction in Children with Dengue Fever Between 2 Months to 12 Years* (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
3. Arshad I, Malik FA, Hussain A, Shah SA. Dengue fever: Clinico-pathologic correlations and their association with poor outcome. The Professional Medical Journal. 2011 Mar 10;18(01):57-63. https://doi.org/10.29309/tpmj/2011.18.01.1859
4. Fernando, Samitha, Ananda Wijewickrama, Laksiri Gomes, Chameera T. Punchihewa, S. D. P. Madusanka, Harsha Dissanayake, Chandima Jeewandara, Hemantha Peiris, Graham S. Ogg, and Gathsaurie Neelika Malavige. "Patterns and causes of liver involvement in acute dengue infection." *BMC infectious diseases* 16 (2016): 1-9. https://doi.org/10.1186/s12879-016-1656-2
5. Palmal, S., Chakraborty, S., Ganguly, S., Kundu, S., Dey, J.B., Pramanik, K. and Pattanayak, A.K., 2023. Study of Hepatic Dysfunction Associated with Dengue Epidemiology in a Tertiary Care Hospital, Kolkata. *ACS omega*, *8*(7), pp.6632-6637. https://doi.org/10.1021/acsomega.2c07119
6. Sadiq S, Mobeen A, Ashraf N, Hashmi F, Munir S, Ahmad A. Clinical Profile and Liver Functions in Dengue Fever. Journal of Rawalpindi Medical College. 2024 Dec 31;28(4). https://doi.org/10.37939/jrmc.v28i4.2486
7. Arifuzzaman MD, Hossain MS, Islam N, Al Noman A, Baroi B, Islam TS, Bhowmik GC, ur Rahman M. Liver function derangement and bleeding morbidity in dengue fever and dengue haemorrhagic fever in a tertiary hospital in Bangladesh. Bangladesh Journal of Medicine. 2022;33(1):44-51. https://doi.org/10.3329/bjm.v33i1.56789
8. Jagadishkumar K, Jain P, Manjunath VG, Umesh L. Hepatic involvement in dengue fever in children. Iranian journal of pediatrics. 2012 Jun;22(2):231.
9. Madhusudan, S.R., Prabhavathi, R., Suman, M.G., Govindaraj, M. and Puttaswamy, M., Prevalence of hepatobiliary dysfunction and ultrasonographic abnormalities in dengue fever in pediatric age group. https://doi.org/10.18203/2349-3291.ijcp20161025
10. 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 Sep 1;24(9):640-4.
11. Ravilla, Sreegeetha, K. V. Padmaprakash, N. Arun, and Ravi Kanth. "Liver Function Test Abnormalities: Do They Correlate with Severity in Dengue Infection? An Indian Perspective." *Journal of Marine Medical Society* 25, no. 1 (2023): 48-52. https://doi.org/10.4103/jmms.jmms_88_22
12. Roy, Amrita, Debalina Sarkar, Sohini Chakraborty, Jasodhara Chaudhuri, Pramit Ghosh, and Swapna Chakraborty. "Profile of hepatic involvement by dengue virus in dengue infected children." *North American journal of medical sciences* 5, no. 8

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(2013): 480. https://doi.org/10.4103/1947-2714.117313

13. Campana, V., Inizan, C., Pommier, J.D., Menudier, L.Y., Vincent, M., Lecuit, M., Lamballerie, X.D., Dupont-Rouzeyrol, M., Murgue, B. and Cabié, A., 2024. Liver involvement in dengue: A systematic review. *Reviews in Medical Virology*, *34*(4), p.e2564. https://doi.org/10.1002/rmv.2564
14. Samanta, Jayanta, and Vishal Sharma. "Dengue and its effects on liver." *World Journal of Clinical Cases: WJCC* 3, no. 2 (2015): 125. https://doi.org/10.12998/wjcc.v3.i2.125
15. Nayak, J.A.D.U.M.A.N.I., Behera, S.U.D.E., Swain, S.K. and Panda, S.R., 2017. A study of multiorgan dysfunction in patients with dengue and its clinicohematological correlation with severity. *Asian J Pharm Clin Res*, *10*(2), pp.218-221. https://doi.org/10.22159/ajpcr.2017.v10i2.15332
16. Singh, S., Meena, J.K., Verma, C.R. and Bhaskar, V., 2015. A hospital-based study of hepatic dysfunction in children with dengue fever. *Asian Pacific Journal of Tropical Disease*, *5*(12), pp.964-967. https://doi.org/10.1016/s2222-1808(15)60965-3
17. Vega, R.M., Phumratanaprapin, W., Phonrat, B., Dhitavat, J., Sutherat, M. and Choovichian, V., 2016. Differences in liver impairment between adults and children with dengue infection. *The American journal of tropical medicine and hygiene*, *94*(5), p.1073. https://doi.org/10.4269/ajtmh.15-0507
18. Leowattana W, Leowattana T. Dengue hemorrhagic fever and the liver. World journal of hepatology. 2021 Dec 27;13(12):1968. https://doi.org/10.4254/wjh.v13.i12.1968

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