



Acute liver failure associated with severe dengue in a young adult with obesity

Insuficiencia hepática aguda asociada al dengue grave en un adulto joven con
obesidad

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ABSTRACT

Background: Severe dengue can lead to multiorgan dysfunction, among which acute liver failure (ALF) is a rare but life-threatening complication.

Objective: To present a rare case of ALF associated with severe dengue in a young adult with obesity.

Clinical Case: A 19-year-old obese male college student (BMI 33 kg/m²) who was admitted with persistent high-grade fever for 4 days, headache, myalgia, and vomiting. He was diagnosed with severe dengue presenting with shock, severe hepatic involvement complicated by ALF, sepsis, and respiratory failure. Laboratory findings revealed markedly elevated transaminases (AST 4686 U/L,



ALT 1231 U/L), total/direct bilirubin of 91/55 $\mu\text{mol/L}$, INR of 1.92, serum ammonia of 272 $\mu\text{g/dL}$, and blood lactate of 8.3 mmol/L. The patient was managed intensively with high-flow nasal cannula oxygen therapy, plasma exchange, L-ornithine L-aspartate infusion, intravenous meropenem, and supportive care in the intensive care unit. His condition gradually improved, with resolution of hepatic and respiratory dysfunction, and he was discharged in stable condition after 10 days of illness.

Conclusion: Acute liver failure can occur in the course of severe dengue, particularly in patients with risk factors such as obesity. Early recognition and aggressive management are essential for improving clinical outcomes.

Keywords: acute liver failure; obesity; plasma exchange; severe dengue.

RESUMEN

Antecedentes: El dengue grave puede provocar disfunción multiorgánica. Una complicación poco frecuente pero potencialmente mortal es la insuficiencia hepática aguda (IHA).

Objetivo: Presentar un caso raro de IHA asociada con dengue grave en un adulto joven con obesidad.

Caso Clínico: Estudiante universitario, masculino, 19 años de edad, obeso (IMC 33 kg/m^2). Ingresó con fiebre alta persistente durante 4 días, cefalea, mialgias y vómitos. Se diagnosticó con dengue grave, con *shock*, afectación hepática grave, complicada por IHA, sepsis e insuficiencia respiratoria. Exámenes de laboratorio: elevación marcada de transaminasas (AST 4686 U/L, ALT 1231 U/L), bilirrubina total/directa en 91/55 $\mu\text{mol/L}$, INR en 1,92, amoníaco sérico en 272 $\mu\text{g/dL}$ y lactato sanguíneo en 8,3 mmol/L. Se trató de manera intensiva con oxigenoterapia mediante cánula nasal de alto flujo, recambio plasmático, infusión de L-ornitina L-aspartato, meropenem i.v. y cuidados de soporte, en la unidad de cuidados intensivos. Mejoró gradualmente, con resolución de la disfunción hepática y respiratoria. Egresó en condición estable después de 10 días de enfermedad.



Conclusión: La IHA puede presentarse en el curso del dengue grave, especialmente en pacientes con factores de riesgo como la obesidad. El reconocimiento temprano y el manejo intensivo son esenciales para mejorar el pronóstico clínico.

Palabras clave: dengue grave; insuficiencia hepática aguda; obesidad; recambio plasmático.

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INTRODUCTION

Dengue fever is an infectious disease caused by the dengue virus and transmitted by *Aedes* mosquitoes. While most cases follow a self-limiting course, a small proportion may progress to severe dengue, characterized by plasma leakage, shock, severe bleeding, and organ dysfunction. Among these complications, acute liver failure (ALF) is a rare but potentially fatal condition if not promptly recognized and managed.^(1,2,3) Its occurrence in young adults with obesity is particularly uncommon, highlighting the need to consider host metabolic factors when assessing disease severity.

The objective of this report is to present a rare case of acute liver failure associated with severe dengue in a young adult with obesity, aiming to provide insights that may support early recognition and management of similar high-risk patients.

CLINICAL CASE

A 19-year-old male college student with class I obesity (BMI 33 kg/m²), no prior liver disease, and no hepatotoxic drug use was admitted on illness day 4, with persistent high-grade fever, headache, myalgia, vomiting, and anorexia.



He was diagnosed with dengue fever with warning signs. Initial labs revealed positive NS1 antigen, platelets $38 \times 10^9/L$, hematocrit 47.1%, AST 720 U/L, and ALT 490 U/L. By midday, he developed compensated shock (BP 100/80 mmHg, HR 140 bpm, CRT ≈ 2 s, Hct 47.3%) and responded well to fluid resuscitation with normal saline at 15 mL/kg/h.

On illness day 5, after 24 hours of stable hemodynamics, fluids were discontinued. Later that day, labs showed evidence of acute liver failure: AST 4686 U/L, ALT 1231 U/L, PT 42%, INR 1.92, ammonia 213 $\mu g/dL$, and lactate 8.3 mmol/L. Chest X-ray revealed left-sided pneumonia and abdominal ultrasound showed mild ascites. He was transferred to the ICU with a diagnosis of severe dengue complicated by ALF in the post-shock phase, concurrent sepsis, and respiratory failure.

Management included high-flow nasal cannula oxygen, daily plasma exchange (1–1.5 plasma volumes), i.v meropenem (1 g every 8 hours), L-ornithine L-aspartate (10 g/day), platelet transfusions (2 units/day), vitamin K1 (10 mg/day), and i.v. albumin 20% (100 mL/day).

By illness day 8, the patient improved significantly with normalization of liver function and coagulation, resolution of respiratory symptoms, and oxygen discontinuation. He was discharged on day 10 in stable condition. Laboratory trends are summarized in table 1.


Table 1 - Summary of laboratory results

Laboratory results	Day 4 (1 st test)	Day 4 (2 nd test)	Day 5	Day 6	Day 7	Day 8	Day 9
Dengue NS1Ag	Positive	-	-	-	-	-	-
White blood cell count ($\times 10^9$ / L)	6.3	5.6	8.7	16.9	18.5	20.8	12.0
Neutrophils ($\times 10^9$ / L)	4.2	3.6	5.6	11.8	11.0	11.9	7.1
Hematocrit (%)	47.1	47.3	45.9	46.6	38.2	35.0	33.7
Platelet count ($\times 10^9$ / L)	38	24	9.0	22	61	127	127
Prothrombin time (%)	92	-	42	65	61	79	-
INR	1.06	-	1.92	1.34	1.41	1.17	-
Fibrinogen (g/ L)	-	-	3.03	-	2.92	3.46	-
D-dimer (ng/ mL)	-	-	1580	-	-	-	-
Procalcitonin (ng/ mL)	-	-	1.75	-	-	-	0.727
Blood lactate (mmol/ L)	4.3	-	8.3	-	7.1	1.9	-
Urea (mmol/ L)	3.9	-	-	3.9	4.0	4.0	-
Creatinine (μ mol/ L)	83	-	78	65	64	73	-
AST (U/ L)	720	1051	4686	4490	2767	1323	720
ALT (U/ L)	490	455	1231	1347	1237	911	593
Total bilirubin (μ mol/ L)	27	-	91	-	73.4	65.0	44.5
Direct bilirubin (μ mol/ L)	15.3	-	55.1	-	49.5	37.6	23.7
Total protein (g/ L)	-	-	45	-	-	-	62
Albumin (g/ L)	-	-	28	-	-	-	28
Ammonia (μ g/ dL)	-	-	213	-	272	-	116
Arterial blood gas							
pH	-	-	7.508	-	-	-	-
pCO ₂ (mmHg)	-	-	15.9	-	-	-	-
pO ₂ (mmHg)	-	-	85.7	-	-	-	-
HCO ₃ ⁻ (mmol/ L)	-	-	12.2	-	-	-	-
Base excess (mmol/ L)	-	-	-6.9	-	-	-	-
Anti-HAV IgM	Negative	-	-	-	-	-	-
HBsAg	Negative	-	-	-	-	-	-
Anti-HCV	Negative	-	-	-	-	-	-

NS1Ag – Nonstructural protein 1 antigen. INR – International Normalized Ratio. AST – Aspartate aminotransferase.

ALT – Alanine aminotransferase. Anti-HAV IgM – Hepatitis A virus IgM antibody. HBsAg – Hepatitis B surface antigen. Anti-HCV – Hepatitis C virus antibody.





Ethical considerations

Written informed consent was obtained from the patient for publication of this case report.

COMMENTS

Hepatic involvement in dengue infection

Liver injury is a common feature of dengue, though ALF remains rare and typically occurs in severe forms such as shock, severe bleeding, or multiorgan dysfunction.^(4,5,6) In another study of 1926 dengue patients, 13.3% had moderate to severe liver injury, while ALF was observed in only 0.31%⁽³⁾. *Nguyen QT et al.*⁽¹⁾ reported ALF in 24.2% of 178 patients with AST/ALT ≥ 1000 U/L. *Leowattana W et al.*⁽⁷⁾ found hepatocellular injury in up to 90% of dengue cases, with ALF-related mortality rates ranging from 20% to 68.3% despite its low incidence (0.31–1.1%). In current case, the patient had AST/ALT of 4686/1231 U/L, total bilirubin 91 $\mu\text{mol/L}$, prolonged PT, elevated ammonia, and a MELD score of 19—fulfilling criteria for ALF.

Pathophysiology of dengue-associated ALF

The pathogenesis of liver dysfunction in dengue is multifactorial. Proposed mechanisms include direct viral cytopathic effects on hepatocytes, dysregulated host immune responses leading to immunopathology, ischemic hepatic injury due to hypoperfusion in dengue shock syndrome, or a combination of these factors.^(8,9,10) In this case, several contributing risk factors for ALF were identified: dengue shock, secondary bacterial infection (as suggested by an elevated procalcitonin level of 1.75 ng/mL), hyperammonemia, and obesity.

Role of obesity in disease prognosis

The patient had a BMI of 33 kg/m², corresponding to class I obesity. Obesity has been recognized as an independent risk factor for increased disease severity in dengue infection.⁽¹¹⁾ Beyond epidemiological observations, several pathophysiological mechanisms may underlie this association. Obesity induces chronic low-grade inflammation, alters cytokine balance (elevated IL-



6, TNF- α), and causes hepatic steatosis and insulin resistance, which may sensitize hepatocytes to viral and hypoxic injury. These metabolic derangements amplify immune dysregulation and oxidative stress, potentially worsening hepatic necrosis in severe dengue.^(11,12,13)

Therapeutic approach: N-Acetylcysteine and plasma exchange

N-acetylcysteine (NAC) mitigates oxidative stress by replenishing glutathione, scavenging free radicals, enhancing hepatic perfusion, and reducing inflammation. It has demonstrated clinical benefits in dengue-associated ALF. *Shrestha DB et al.*⁽¹⁴⁾ reported that NAC use in patients with ALF resulted in a 53% lower mortality rate compared to standard care. However, intravenous NAC was unavailable in this case, and high-volume plasma exchange (HVPE) was used as an alternative. HVPE may reduce the inflammatory burden in ALF by removing cytokines and damage-associated molecular patterns.⁽¹⁵⁾

Both European Association for the Study of the Liver (2017)⁽¹⁶⁾ and the American Society for Apheresis (2019)⁽¹⁷⁾ recommend early HVPE in ALF management. In Asia, plasma exchange and NAC are increasingly adopted for dengue-related ALF.^(18,19) Alternative therapies such as continuous renal replacement therapy or Molecular adsorbent recirculating system may also improve detoxification in ALF, but are less accessible in low-resource settings. Although plasma exchange was temporally associated with rapid improvement in this case, causality cannot be conclusively established, and recovery could have been aided by intensive supportive measures (hemodynamic stability, oxygenation, and infection control). Nonetheless, early HVPE remains a promising adjunctive therapy, particularly where NAC or liver transplantation are unavailable.

Acute liver failure can occur in the course of severe dengue, particularly in patients with risk factors such as obesity. Early recognition and aggressive management are essential for improving clinical outcomes.



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Conflicts of interest

The authors declare no conflicts of interest.

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Data Availability Statement

The data used to present the case corresponds to Can Tho Central General Hospital, Vietnam.