Volume 3, Issue 4, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

IN-HOSPITAL MORTALITY AND LIPID PROFILE IN PATIENTS WITH HEPATIC ENCEPHALOPATHY: A STUDY FROM A TERTIARY CARE HOSPITAL IN KARACHI

Dr. Mahnoor Jamal[*1], Dr. Muhammad Omer Sultan[2], Dr. Muhammad Inam Khan[3], Dr. Anjli Tara[4], Dr. Yumna Iqbal[5], Dr. Hina Kumari[6], Osama Zahid[7], Ruba Jamal[8], Fiza Jamal[9]

[*1,2,3,4,5,6]*Jinnah Post Graduate Medical Centre*

[*1]mahnoor.j4123@gmail.com, [2]dr.omersultan@hotmail.com, [3]drinam373@gmail.com, [4]anjli.tara@gmail.com, [5]yumna_iqbal@hotmail.com, [6]kumari.hina17@yahoo.com, [7]osamazahid1@gmail.com, [8]ruba.jkhan01@gmail.com, [9]fizajamal001@gmail.com

DOI: https://doi.org/10.5281/zenodo.15589610

Keywords
Hepatic encephalopathy, In-hospital mortality, Lipid profile, Cholesterol, HDL, Cirrhosis, Risk stratification, Pakistan, Low-resource setting, Liver disease prognosis.

Article History
Received on 26 April 2025
Accepted on 26 May 2025
Published on 04 June 2025

Copyright @Author

Corresponding Author: *
Dr. Mahnoor Jamal

Abstract

Background: *Hepatic encephalopathy (HE) poses a major challenge in the management of chronic liver disease and contributes significantly to in-hospital mortality. In low-resource settings, identifying simple and affordable predictors of poor outcomes remains crucial. This study examined the frequency of in-hospital mortality among patients with HE and explored the association between lipid profiles, disease severity, and survival.*

Methods: *We carried out a descriptive cross-sectional study over six months at the Department of Medicine, Jinnah Postgraduate Medical Centre, Karachi. We enrolled 112 patients aged 40–80 years who presented with HE within 24 hours of admission. We excluded patients with comorbid conditions likely to confound outcomes. We recorded demographic data, clinical grade of encephalopathy, and lipid profile values, and compared these variables between survivors and non-survivors.*

Results: *In-hospital mortality occurred in 45.5% of patients. All patients with Grade 4 HE died, and over half of those with Grade 3 also did not survive. Patients who died showed significantly lower levels of cholesterol, LDL, HDL, and triglycerides compared to survivors ($p = 0.01$ for all). None of the patients with Grade 1 or 2 HE died.*

Conclusion: *Patients with advanced hepatic encephalopathy faced a high risk of in-hospital mortality. Lower lipid levels, particularly reduced HDL and total cholesterol, were strongly linked to fatal outcomes. These findings suggest that routine lipid profiling may offer a practical and inexpensive tool to support early risk stratification in clinical settings where more complex scoring systems are not readily available.*

INTRODUCTION

Hepatic encephalopathy is a disorder involving neuropsychiatric disturbances that occur in individuals with liver dysfunction, after other brain diseases have been ruled out.[1] It is typically characterized by alterations in personality, cognitive decline, and diminished levels of consciousness.[2-3] The development of hepatic encephalopathy critically depends on the diversion of portal blood into the systemic circulation via portosystemic collateral pathways. [4] Hepatic encephalopathy may

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

develop secondary to underlying liver disease, leading to metabolic dysfunction, or due to the formation of portosystemic shunts, such as transjugular intrahepatic portosystemic shunts (TIPS) or naturally occurring spontaneous shunts. [5] The first type is associated with liver dysfunction, whereas the second involves the diversion of portal blood into the systemic circulation, bypassing the liver and resulting in the buildup of toxic substances. [6] A population-based study estimated that nearly 44% of individuals with cirrhosis could develop hepatic encephalopathy within five years. In a separate study involving more than 9,000 patients newly diagnosed with cirrhosis, approximately one-third presented with decompensated cirrhosis, and among these patients, 51% were found to have hepatic encephalopathy. [7]

Acute liver failure may result from a range of causes, including viral hepatitis, exposure to hepatotoxic agents like acetaminophen, certain mushrooms, and alcohol, as well as ischemic liver injury due to conditions such as septic shock. [8]. Chronic liver failure associated with cirrhosis can arise from several conditions, including alcoholic cirrhosis, chronic hepatitis B or C infections, nonalcoholic fatty liver disease (NAFLD), hemochromatosis, Wilson's disease, and alpha-1 antitrypsin deficiency. [9] In patients with liver cirrhosis, hepatic encephalopathy can be precipitated by a range of factors, including renal dysfunction, gastrointestinal bleeding (such as bleeding from esophageal varices), constipation, infections, poor adherence to medications, high dietary protein intake, and dehydration caused by fluid restrictions, diuretic use, diarrhea, vomiting, or excessive paracentesis. Additional triggers include electrolyte disturbances, alcohol consumption, and the use of certain sedatives or analgesic medications. [10]

Lipids are vital components that regulate cellular functions and maintain homeostasis.[11] The liver plays a crucial role in lipid metabolism, overseeing various stages of lipid synthesis and transport. Consequently, individuals with severe liver dysfunction are likely to exhibit abnormalities in their lipid profiles. [12] Patients with cirrhosis often require regular follow-up visits and repeated hospitalizations to manage the disease and its complications.[13] However, selecting an appropriate treatment strategy depends largely on the severity and nature of liver damage, as well as the ability to accurately assess its extent. [14] Patients with hepatic encephalopathy (HE) often experience disrupted lipid metabolism due to impaired liver function, resulting in lower levels of cholesterol and triglycerides. These lipid alterations may correlate with the severity of the disease and its prognosis, potentially affecting in-hospital mortality rates. Gaining a better understanding of lipid profile changes in HE patients could offer valuable insights into the progression and outcomes of the condition. [15] A study done by Duah et al found that out of 53 participants with hepatic encephalopathy, 75.5% (40/53) had in-hospital mortality.[16]

Hepatic encephalopathy (HE) is a severe complication of chronic liver disease, often associated with significant morbidity and mortality. Patients with HE frequently exhibit metabolic disturbances, including alterations in lipid profiles due to impaired liver function. While lipid abnormalities have been studied in various liver diseases, their role in the severity and outcomes of HE remains unclear. Investigating the lipid profile in HE patients may help identify potential biomarkers for disease severity and prognosis. Additionally, understanding the relationship between lipid abnormalities and in-hospital mortality could provide valuable insights for risk stratification and management strategies.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted over a six-month period at the Department of Medicine, Jinnah Postgraduate Medical Centre (JPMC), Karachi, following the necessary approvals from the College of Physicians and Surgeons Pakistan and the institutional ethical review committee. A total of 112 patients were enrolled based on a calculated sample size using WHO software, considering an expected in-hospital mortality rate of 75.5%, an 8% margin of error, and a 95% confidence interval. Participants were recruited through a non-probability consecutive sampling technique.

Eligible participants included male and female patients aged between 40 and 80 years who present with hepatic encephalopathy within 24 hours of admission, as defined by specific clinical and

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

biochemical criteria. Patients with acute hepatic failure, malignancies, diabetes mellitus, hypothyroidism, hyperthyroidism, congestive heart failure, asthma, chronic kidney disease, chronic obstructive pulmonary disease, or stroke were excluded from the study.

After obtaining written informed consent from the patients or their legal representatives, relevant details including demographic data was collected at the time of hospital admission. Confidentiality of patient data was strictly maintained. The severity of hepatic encephalopathy was assessed upon admission by the researcher using the West Haven Criteria. Fasting blood samples (5 ml) was collected from each patient via peripheral venipuncture using a sterile 5 cc syringe. These samples were sent for laboratory analysis to evaluate lipid profiles, including cholesterol, triglycerides, low-density lipoproteins (LDL), and high-density lipoproteins (HDL). Patients were then monitored throughout their hospital stay, and any in-hospital mortality occurring within 14 days was documented in accordance with the operational definition.

Data entry and analysis was performed using SPSS version 20. Quantitative variables such as age and lipid profile components will be assessed for normality using the Kolmogorov–Smirnov test. Normally distributed data was presented as means with standard deviations, whereas non-normally distributed variables was reported as medians with interquartile ranges. Categorical variables including gender, residential status, hepatic encephalopathy severity, and in-hospital mortality was summarized using frequencies and percentages. To evaluate the influence of potential confounding factors, stratification was applied for variables such as age, gender, residence, and severity of encephalopathy. Post-stratification, statistical significance was tested using the chi-square test or Fisher's exact test for categorical data, and either the independent t-test or Mann–Whitney U test for continuous data, depending on the distribution. A p-value of ≤ 0.05 was considered statistically significant throughout the analysis.

RESULTS

In this data of 112 patients admitted with hepatic encephalopathy, most individuals (75%) were between 40 and 60 years of age, while the remaining 25% were aged 61 to 80 years. Females represented a slightly higher proportion of the sample (54.5%) compared to males (45.5%). The majority of patients (78.6%) resided in urban areas. With regard to the clinical severity of hepatic encephalopathy, 8% were classified as Grade 1, 31.2% as Grade 2, another 31.2% as Grade 3, and 29.5% as Grade 4. The overall in-hospital mortality rate stood at 45.5%. Baseline lipid parameters showed a mean cholesterol level of 137.9 ± 32.8 mg/dl, triglycerides 86.8 ± 28.8 mg/dl, LDL 93.4 ± 25.9 mg/dl, and HDL 27.7 ± 8.91 mg/dl.

Patients who died during hospitalization more frequently belonged to the older age group (61–80 years), accounting for 60.7% of deaths compared to 40.5% among those aged 40–60 years, though this association approached but did not reach statistical significance ($p = 0.06$). Gender and residence status did not significantly influence mortality ($p = 0.49$ and $p = 0.15$, respectively), although a higher proportion of male and rural patients experienced in-hospital death. Mortality was closely linked to the severity of hepatic encephalopathy ($p = 0.01$). All patients with Grade 4 encephalopathy died, while no deaths were observed among those with Grades 1 or 2. Among patients with Grade 3, 51.4% died in hospital.

Patients who died had significantly lower lipid levels compared to those who survived. Mean cholesterol among non-survivors was 118.7 ± 22.6 mg/dl versus 154.0 ± 31.4 mg/dl among survivors ($p = 0.01$). Similarly, non-survivors had lower triglyceride levels (74.4 ± 19.0 mg/dl vs. 97.2 ± 31.5 mg/dl), LDL (83.6 ± 20.9 mg/dl vs. 101.6 ± 26.9 mg/dl), and HDL (20.3 ± 4.11 mg/dl vs. 34.0 ± 6.7 mg/dl), with all comparisons reaching statistical significance ($p = 0.01$ for each parameter). These findings suggest that lower serum lipid concentrations may be associated with increased risk of in-hospital mortality among patients presenting with hepatic encephalopathy.

DISCUSSION

This study examined in-hospital mortality in patients admitted with hepatic encephalopathy, with a particular focus on the relationship between lipid profile and disease severity. [17] We observed a high in-hospital mortality rate of 45.5%, which closely aligns with findings from other resource-limited settings,

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

such as the 48% reported by Onyekwere et al. in Nigeria.[18] In contrast, Stepanova et al. reported significantly lower rates in the United States, ranging from 14% to 15% over a five-year period, highlighting the influence of healthcare access and infrastructure on patient outcomes. [17]

The severity of hepatic encephalopathy strongly predicted patient outcomes in our cohort. All patients presenting with Grade 4 encephalopathy died during their hospital stay, while over half of those with Grade 3 encephalopathy also succumbed. These findings are consistent with the work of Bajaj et al., who found that higher encephalopathy grades independently predicted both in-hospital and 30-day mortality, even when controlling for other organ failures. [19] Similarly, Abbasy et al. reported that grades III and IV encephalopathy were associated with increased mortality among ICU patients in Egypt. [20] Our data reinforce these observations and suggest that timely recognition and intervention in lower grades may improve survival.

We found that lipid profiles differed significantly between survivors and non-survivors. Patients who died had notably lower levels of cholesterol, triglycerides, LDL, and HDL. This aligns with prior work by Tauseef et al., who reported that lipid levels declined progressively with worsening chronic liver disease. [21] Likewise, Asghar et al. observed high rates of dyslipidemia among patients with cirrhosis, particularly among those with advanced liver dysfunction. [22] These patterns likely reflect impaired hepatic synthesis, malnutrition, and systemic inflammation, all of which contribute to metabolic derangement in cirrhosis. [23]

Beyond their diagnostic value, lipid markers may also offer prognostic information. Low HDL, in particular, has been linked to increased susceptibility to infections and poor clinical outcomes in liver disease. [24] HDL plays a known role in modulating inflammation and oxidative stress, which may partially explain its association with mortality in critically ill patients. [25] Our findings support further exploration of lipid parameters as adjunctive tools in the clinical assessment of hepatic encephalopathy, particularly in settings where advanced scoring systems like MELD-Na or CLIF-SOFA are not routinely available.

While patient age, gender, and residence did not significantly predict mortality in our analysis, we observed trends suggesting worse outcomes in older adults and those from rural areas. Older age has previously been associated with increased risk in HE due to comorbidities and diminished physiological reserves. [26] These social and demographic factors warrant attention in public health planning and resource allocation.

We used the West Haven criteria to grade encephalopathy and found the tool useful for stratifying risk in clinical practice. Our results support its continued use, particularly when combined with other prognostic markers like serum lipids. [27] Given our setting, where advanced diagnostics and intensive care facilities may be limited, these findings offer practical value. As Jalan et al. have shown, prognostic tools that integrate multiple physiological indicators can improve patient assessment and guide treatment decisions. [28]

This study has several strengths, including its focus on a potentially low-cost prognostic biomarker and its relevance to real-world clinical practice in a lower-middle-income country. However, the single-center design and relatively small sample size limit the generalizability of our findings. We also did not include established prognostic scores like MELD or CLIF-SOFA, which would have allowed for more robust comparisons. Future studies should address these gaps and investigate how lipid markers might complement existing scoring systems in predicting outcomes for HE.

LIMITATIONS

We conducted this study at a single tertiary care hospital. This may limit how well the findings apply to other settings. By using non-probability consecutive sampling, we may have introduced some selection bias. We deliberately excluded patients with common comorbidities to control for confounding. However, this decision also narrowed the scope of our findings. Because the study used a cross-sectional design, we could not assess changes over time or establish causality. We also did not incorporate established prognostic tools like MELD or CLIF-SOFA for comparison. Lastly, we did not collect post-discharge follow-up data, which limits our understanding of longer-term outcomes.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

CONCLUSION

This study identified a high in-hospital mortality rate among patients with hepatic encephalopathy. Patients who died had consistently shown lower levels of cholesterol, LDL, triglycerides, and HDL, suggesting a potential role for lipid profile as a marker of poor prognosis. These findings point to the value of incorporating routine lipid assessment into the clinical evaluation of patients with hepatic encephalopathy. Especially in settings where advanced prognostic tools may not be available.

Table 1: Distribution of baseline characteristics among the study participants.

Variables	n (%)
Age	
40 to 60 years	84 (75)
61 to 80 years	28 (25)
Gender	
Male	51 (45.5)
Female	61 (54.5)
Residence status	
Urban	88 (78.6)
Rural	24 (21.4)
Severity of hepatic encephalopathy	
Grade 1	09 (8)
Grade 2	35 (31.2)
Grade 3	35 (31.2)
Grade 4	33 (29.5)
In-hospital mortality	
Yes	51 (45.5)
No	61 (54.5)
Lipid Profile	
Cholesterol (mg/dl)	137.9±32.8
Triglyceride (mg/dl)	86.8±28.8
LDL (mg/dl)	93.4±25.9
HDL (mg/dl)	27.7±8.91
Total	112 (100)

Table 2: Distribution of patient characteristics according to the In-hospital mortality.

Variables	In-hospital mortality Yes n (%)	In-hospital mortality No n (%)	P value
Age			0.06
40 to 60 years	34 (40.5)	50 (59.5)	
61 to 80 years	17 (60.7)	11 (39.3)	
Gender			0.49
Male	25 (49)	26 (51)	
Female	26 (42.6)	35 (57.4)	
Residence status			0.15
Urban	37 (42)	79 (70.5)	
Rural	14 (58.3)	10 (41.7)	
Severity of hepatic encephalopathy			0.01
Grade 1	00 (00)	09 (100)	

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Grade 2 Grade 3 Grade 4	00 (00) 18 (51.4) 33 (100)	35 (100) 17 (48.6) 00 (00)	
Lipid Profile Cholesterol (mg/dl) Triglyceride (mg/dl) LDL (mg/dl) HDL (mg/dl)	 118.7±22.6 74.4±19.0 83.6±20.9 20.3±4.11	 154.0±31.4 97.2±31.5 101.6±26.9 34.0±6.7	 0.01 0.01 0.01 0.01

REFERENCES:

Elwir S, Rahimi RS. Hepatic encephalopathy: an update on the pathophysiology and therapeutic options. Journal of clinical and translational hepatology. 2017 Jun 6;5(2):142.

Cash WJ, McConville P, McDermott McCormick PA, Callender ME, McDougall NI. Current concepts in the assessment and treatment of hepatic encephalopathy. QJM: An International Journal of Medicine. 2010 Jan 1;103(1):9-16.

Dellatore P, Cheung M, Mahpour NY, Tawadros A, Rustgi VK. Clinical manifestations of hepatic encephalopathy. Clin Liver Dis. 2020 May 1;24(2):189-96.

Trifan A, Minea H, Rotaru A, Stanciu C, Stafie R, Stratina E, Zenovia S, Nastasa R, Singeap AM, Girleanu I, Muzica C. Predictive factors for the prognosis of alcoholic liver cirrhosis. Medicina. 2022 Dec 16;58(12):1859.

Mezzano G, Juanola A, Cardenas A, Mezey E, Hamilton JP, Pose E, Graupera I, Ginès P, Solà E, Hernaez R. Global burden of disease: acute-on-chronic liver failure, a systematic review and meta-analysis. Gut. 2022 Jan 1;71(1):148-55.

Hassal E, Benson L, Hart M, Krieger DE. Hepatic encephalopathy after portacaval shunt in a noncirrhotic child. Journal Pediatr 1984 Sep 1;105(3):439-41.

Bohra A, Worland T, Hui S, Terbah R, Farrell A, Robertson M. Prognostic significance of hepatic encephalopathy in patients with cirrhosis treated with current standards of care. World J Gastroenterol 2020 May 5;26(18):2221.

Bleibel W, Al-Osaimi AM. Hepatic encephalopathy. Saudi J Gastroenterol 2012 Sep 1;18(5):301-9.

Wang DW, Yin YM, Yao YM. Advances in the management of acute liver failure. World J Gastroenterol. 2013 Nov 11;19(41):7069.

Bohra A, Worland T, Hui S, Terbah R, Farrell A, Robertson M. Prognostic significance of hepatic encephalopathy in patients with cirrhosis treated with current standards of care. World J Gastroenterol 2020 May 5;26(18):2221.

Irshad M, Dube R, Joshi YK. Impact of viral hepatitis on apo- and lipoprotein status in blood. Med Princ Pract. 2007;16(4):310–4.

Ghadir MR, Riahin AA, Havaspour A, Nooranipour M, Habibinejad AA. The relationship between lipid profile and severity of liver damage in cirrhotic patients. Hepat Mon. 2010 Fall;10(4):285-8.

Ghadir MR, Riahin AA, Havaspour A, Nooranipour M, Habibinejad AA. The relationship between lipid profile and severity of liver damage in cirrhotic patients. Hepat Mon. 2010 Fall;10(4):285-8.

Shi K, Bi Y, Wang X, Li Y, Zeng X, Feng Y, Wang X. Prognostic Value of High-Density Lipoprotein Cholesterol in Patients with Overt Hepatic Encephalopathy. Biomedicines. 2024 Aug 6;12(8):1783.

Cheng R, Tan N, Kang Q, Luo H, Chen H, Pan J, Han Y, Yang Y, Xu X. High-density lipoprotein cholesterol is a predictor of survival in cirrhotic patients with acute gastrointestinal bleeding: a retrospective study. BMC gastroenterology. 2020 Dec;20:1-9.

Duah A, Agyei-Nkansah A, Osei-Poku F, Duah F, Ampofo-Boobi D, Peprah B. The prevalence, predictors, and in-hospital mortality of hepatic encephalopathy in patients with liver cirrhosis admitted at St. Dominic Hospital in Akwatia,

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Ghana. Can J Gastroenterol Hepatol. 2020 Dec 22;2020:8816522.

Stepanova M, Mishra A, Venkatesan C, Younossi ZM. In-hospital mortality and economic burden associated with hepatic encephalopathy in the United States from 2005 to 2009. Clinical gastroenterology and hepatology. 2012 Sep 1;10(9):1034-41.

Onyekwere CA, Ogbera AO, Hameed L. Chronic liver disease and hepatic encephalopathy: clinical profile and outcomes. Nigerian journal of clinical practice. 2011;14(2):181-5.

Bajaj JS, O'Leary JG, Tandon P, Wong F, Garcia-Tsao G, Kamath PS, Maliakkal B, Biggins SW, Thuluvath PJ, Fallon MB, Subramanian RM. Hepatic encephalopathy is associated with mortality in patients with cirrhosis independent of other extrahepatic organ failures. Clinical Gastroenterology and Hepatology. 2017 Apr 1;15(4):565-74.

Abbasy M, Zaghla H, Elhelbawy M, Ramadan M, Zakareya T. Predicting in-hospital mortality of cirrhotic patients hospitalized with hepatic encephalopathy. Egyptian Liver Journal. 2022 Feb 9;12(1):13.

Tauseef A, Zafar M, Rashid B, Thirumalareddy J, Chalfant V, Farooque U, Mirza M. Correlation of fasting lipid profile in patients with chronic liver disease: a descriptive cross-sectional study in tertiary care hospital. Cureus. 2020 Oct 18;12(10).

Farooque U, Lohano AK, Dahri Q, Arain N, Farukhuddin FN, Khadke C, Prince F, Farooque R, Shehata MA, Zafar MD. The pattern of dyslipidemia in chronic liver disease patients. Cureus. 2021 Feb 10;13(2)..

Sherlock S, Dooley JS. Diseases of the liver and biliary system. John Wiley & Sons; 2008 Apr 15.

Fernández J, Gustot T. Management of bacterial infections in cirrhosis. Journal of hepatology. 2012 Jan 1;56:S1-2.

Barter PJ, Rye KA. The rationale for using apoA-I as a clinical marker of cardiovascular risk. Journal of internal medicine. 2006 May;259(5):447-54.

Bustamante J, Rimola A, Ventura PJ, Navasa M, Cirera I, Reggiardo V, Rodés J. Prognostic significance of hepatic encephalopathy in patients with cirrhosis. Journal of hepatology. 1999 May 1;30(5):890-5.

Ferenci P, Lockwood A, Mullen K, Tarter R, Weissenborn K, Blei AT. Hepatic encephalopathy—definition, nomenclature, diagnosis, and quantification: final report of the working party at the 11th World Congresses of Gastroenterology, Vienna, 1998. Hepatology. 2002 Mar 1;35(3):716-21.

Jalan R, Saliba F, Pavesi M, Amoros A, Moreau R, Ginès P, Levesque E, Durand F, Angeli P, Caraceni P, Hopf C. Development and validation of a prognostic score to predict mortality in patients with acute-on-chronic liver failure. Journal of hepatology. 2014 Nov 1;61(5):1038-47