

Original Article

Frequency of Hepatic Encephalopathy in Patients with Chronic Liver Disease Presented to the Emergency Ward

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ABSTRACT

Background: Hepatic encephalopathy is a clinically important neuropsychiatric complication of chronic liver disease and is frequently associated with emergency presentation, repeated hospitalization, functional impairment, and increased mortality. **Objective:** To determine the frequency of hepatic encephalopathy among patients with chronic liver disease presenting to the emergency ward and to describe its association with selected demographic and clinical characteristics. **Methods:** This prospective observational study was conducted in the Department of Emergency Medicine, Lady Reading Hospital–Medical Teaching Institution, Peshawar, from September 2025 to February 2026. A total of 150 adult patients with chronic liver disease were enrolled using non-probability consecutive sampling. Chronic liver disease was diagnosed using clinical, laboratory, and radiological criteria. Hepatic encephalopathy was assessed clinically and graded according to West Haven criteria. Data were analyzed using SPSS version 26, with categorical variables expressed as frequencies and percentages and quantitative variables summarized as mean \pm standard deviation. **Results:** The mean age of patients was 51.84 ± 12.63 years, and 92 patients (61.3%) were male. Hepatic encephalopathy was present in 49 patients, giving a frequency of 32.7%. Grade II hepatic encephalopathy was the most common presentation, accounting for 38.8% of affected cases. Hepatitis C virus infection was the leading etiology of chronic liver disease. Increasing age and longer duration of chronic liver disease showed significant associations with hepatic encephalopathy. **Conclusion:** Hepatic encephalopathy was a frequent complication among patients with chronic liver disease presenting to emergency care, affecting nearly one-third of the study population. Early recognition, standardized grading, and timely management may help reduce disease-related morbidity and adverse outcomes. **Keywords:** Hepatic encephalopathy; Chronic liver disease; Liver cirrhosis; Emergency ward; West Haven criteria; Hepatitis C; Pakistan.

INTRODUCTION

Chronic liver disease is a progressive clinical condition associated with substantial morbidity, repeated hospitalization, and premature mortality, particularly after the development of cirrhosis and decompensating complications. Globally, chronic liver diseases affect a large population and cirrhosis remains an important contributor to liver-related death, with viral hepatitis, alcohol-related liver disease, and metabolic liver disease representing major etiological drivers (1,2). In emergency care settings, patients with chronic liver disease frequently present with acute deterioration, altered sensorium, gastrointestinal bleeding, infection, electrolyte imbalance, renal dysfunction, or worsening hepatic reserve. Among these complications, hepatic encephalopathy is especially important because it directly

affects consciousness, cognition, functional independence, caregiver burden, length of hospital stay, and short-term survival.

Hepatic encephalopathy is a potentially reversible neuropsychiatric syndrome that occurs in patients with liver dysfunction and/or portosystemic shunting. It ranges from subtle cognitive impairment to confusion, disorientation, somnolence, stupor, and coma, and is commonly graded using the West Haven criteria (3,4). The pathogenesis is multifactorial, with hyperammonemia, systemic inflammation, astrocyte dysfunction, oxidative stress, altered gut microbiota, and impaired blood–brain barrier homeostasis all contributing to cerebral dysfunction (4,5). Overt hepatic encephalopathy develops in a substantial proportion of patients with cirrhosis during the course of disease, while minimal or covert hepatic encephalopathy may remain clinically underrecognized despite its effects on daily functioning, falls, driving ability, sleep, work performance, and quality of life (5,6). Because early stages may be missed and advanced stages are associated with poor outcomes, timely identification in emergency departments is clinically essential.

The clinical burden of hepatic encephalopathy is particularly relevant in low- and middle-income countries, where viral hepatitis remains a dominant cause of chronic liver disease and where emergency departments often serve as the first point of contact for decompensated cirrhotic patients. Studies from Asian populations have reported considerable variation in the frequency of hepatic encephalopathy among hospitalized patients with cirrhosis, reflecting differences in disease severity, etiological patterns, diagnostic criteria, and healthcare access (7,8). In Pakistan, chronic hepatitis C and hepatitis B continue to contribute substantially to cirrhosis and related complications, making hepatic encephalopathy a frequent and clinically important emergency presentation (9,10). The current manuscript also identifies hepatitis C virus infection as the leading etiology among patients with chronic liver disease presenting with hepatic encephalopathy, which is consistent with the national disease burden described in the background literature.

Despite the recognized importance of hepatic encephalopathy, local prospective data from emergency ward populations remain limited. Many available studies have focused on admitted cirrhotic patients, specialized hepatology settings, or retrospective hospital records, which may not fully represent the burden encountered at emergency presentation. This distinction is important because emergency ward patients often present at different stages of clinical instability, and early recognition of hepatic encephalopathy in this setting may influence immediate management, triage decisions, prevention of aspiration, identification of precipitating factors, and timely initiation of therapy. The absence of robust local emergency-based data also limits institutional planning, resource allocation, and development of context-specific protocols for patients with chronic liver disease.

Therefore, the present study was designed to determine the frequency of hepatic encephalopathy among adult patients with chronic liver disease presenting to the emergency ward of Lady Reading Hospital, Peshawar. The study further aimed to describe the clinical grading of hepatic encephalopathy according to West Haven criteria and to assess its association with relevant patient characteristics, including age, gender, etiology of chronic liver disease, and duration of illness. The central research question was: what is the frequency of hepatic encephalopathy among patients with chronic liver disease presenting to the emergency ward, and which clinical characteristics are associated with its occurrence in this population?

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Emergency Medicine, Lady Reading Hospital–Medical Teaching Institution, Peshawar, from September 2025 to February 2026. The study was designed to determine the frequency of hepatic encephalopathy among adult patients with chronic liver disease presenting to the emergency ward and to evaluate its association with selected demographic and clinical characteristics. A hospital-based prospective design was selected because it allowed real-time clinical assessment of eligible patients at emergency presentation, standardized

documentation of hepatic encephalopathy grading, and systematic collection of relevant demographic, etiological, laboratory, and clinical variables during the index encounter.

The study population comprised patients aged 18 years and above of either gender who presented to the emergency department with a confirmed diagnosis of chronic liver disease. Chronic liver disease was defined on the basis of compatible clinical history, physical examination findings, laboratory evidence of chronic hepatic dysfunction, and radiological features suggestive of chronic liver disease, including shrunken liver, coarse hepatic echotexture, portal hypertension, splenomegaly, or ascites on ultrasonography. Patients were enrolled through non-probability consecutive sampling until the required sample size was achieved. Consecutive sampling was used to reduce selection bias by including all eligible patients presenting during the study period who fulfilled the predefined eligibility criteria.

Patients were included if they had established chronic liver disease and presented to the emergency ward with or without altered mental status. Patients were excluded when altered consciousness was attributable to causes other than hepatic encephalopathy, including cerebrovascular accident, meningitis, encephalitis, head trauma, hypoglycemia, septic shock, uremic encephalopathy, psychiatric illness, alcohol intoxication, or drug overdose. Patients with incomplete essential clinical records and those whose attendants did not provide consent were also excluded. Written informed consent was obtained from conscious patients; for patients with impaired consciousness, consent was obtained from attendants or legally acceptable representatives before enrollment and data collection.

Data were collected using a structured predesigned proforma. Demographic variables included age and gender. Clinical variables included duration of chronic liver disease, underlying etiology of liver disease, presenting symptoms, level of consciousness, and clinical features suggestive of decompensation. Etiology of chronic liver disease was categorized on the basis of available clinical history, viral hepatitis profile, laboratory findings, and relevant prior medical documentation. Hepatic encephalopathy was assessed clinically at presentation and graded according to the West Haven classification into grade I, grade II, grade III, and grade IV, based on changes in cognition, behavior, orientation, neuromuscular findings, level of consciousness, and coma severity (11). Patients without clinical evidence of hepatic encephalopathy were categorized as non-HE cases for comparative analysis.

Relevant laboratory investigations were recorded where available, including complete blood count, liver function tests, serum bilirubin, alanine aminotransferase, aspartate aminotransferase, serum albumin, prothrombin time or international normalized ratio, renal function tests, serum electrolytes, serum ammonia level, and viral hepatitis markers. Radiological findings supporting chronic liver disease were documented from ultrasonography records. All clinical assessments were performed during the emergency encounter, and the primary outcome variable was the presence of hepatic encephalopathy among patients with chronic liver disease. Secondary variables included the grade of hepatic encephalopathy and its association with age, gender, duration of chronic liver disease, and etiology of liver disease.

The sample size was calculated using the WHO sample size approach for estimating a single population proportion, taking the expected frequency of hepatic encephalopathy among patients with chronic liver disease as 30%, a 95% confidence level, and a 5% margin of error. A total of 150 patients fulfilling the eligibility criteria were included in the final analysis. To improve data quality and reduce information bias, the same operational definitions were applied throughout data collection, hepatic encephalopathy grading was performed using a standardized clinical classification system, and data were entered from structured forms into the statistical database after checking for completeness and internal consistency.

Potential confounding was addressed by stratifying the presence of hepatic encephalopathy according to clinically relevant variables, including age group, gender, duration of chronic liver disease, and etiology of liver disease. Patients with alternative neurological, metabolic, infectious, traumatic, toxicological, renal, or psychiatric causes of altered mental status were excluded to reduce diagnostic

misclassification. Incomplete records were excluded before final analysis, and available complete data were analyzed without imputation. Data integrity was maintained through standardized data recording, review of completed proformas, and consistency checks before statistical analysis.

Data were entered and analyzed using Statistical Package for Social Sciences version 26. Quantitative variables such as age and duration of chronic liver disease were summarized as mean and standard deviation for normally distributed data or median and interquartile range where distributional assumptions were not met. Qualitative variables such as gender, etiology of chronic liver disease, presence of hepatic encephalopathy, and West Haven grade were expressed as frequencies and percentages. The frequency of hepatic encephalopathy was calculated by dividing the number of patients diagnosed with hepatic encephalopathy by the total number of enrolled chronic liver disease patients and multiplying by 100. Associations between hepatic encephalopathy and categorical variables were assessed using the chi-square test or Fisher's exact test where appropriate. A p-value of less than 0.05 was considered statistically significant.

The study was conducted after approval from the Ethical Review Board of Lady Reading Hospital–Medical Teaching Institution, Peshawar, under approval number 133/LRH/MTI, dated 15 August 2025. Written informed consent was obtained before enrollment. Patient confidentiality was maintained throughout the study by anonymizing data during entry, analysis, and reporting, and all study procedures were conducted in accordance with ethical principles for human participant research.

RESULTS

A total of 150 patients with chronic liver disease presenting to the emergency ward were included in the analysis. The mean age of the study population was 51.84 ± 12.63 years. Male patients constituted 61.3% of the cohort, corresponding to approximately 92 males, while females constituted 38.7%, corresponding to approximately 58 females. Hepatic encephalopathy was identified in 49 patients, giving an overall frequency of 32.7%, while 101 patients did not have clinical evidence of hepatic encephalopathy at presentation. Hepatitis C virus infection was the leading reported etiology of chronic liver disease in the cohort. Increasing age and longer duration of chronic liver disease showed statistically significant associations with hepatic encephalopathy, with reported significance at $p < 0.05$.

Table 1. Baseline Characteristics of Patients with Chronic Liver Disease Presenting to the Emergency Ward

Variable	Total Patients, n = 150	Percentage / Summary
Age, years	51.84 ± 12.63	Mean \pm SD
Male gender	92	61.3%
Female gender	58	38.7%
Chronic liver disease	150	100.0%
Leading etiology	Hepatitis C virus infection	Most frequent etiology
Study setting	Emergency ward	Tertiary care hospital

The baseline profile showed a predominantly middle-aged chronic liver disease population, with a mean age slightly above 51 years. Males represented nearly three-fifths of the cohort, with an approximate male-to-female ratio of 1.6:1. Hepatitis C virus infection was the most frequent underlying etiology, supporting its continuing role as a major contributor to chronic liver disease burden among patients presenting to emergency care.

Table 2. Frequency of Hepatic Encephalopathy Among Patients with Chronic Liver Disease

Hepatic Encephalopathy Status	Frequency, n	Percentage
Present	49	32.7%
Absent	101	67.3%
Total	150	100.0%

Hepatic encephalopathy was present in approximately one-third of patients with chronic liver disease. The observed frequency of 32.7% indicates that for every three patients with chronic liver disease presenting to the emergency ward, nearly one had clinical evidence of hepatic encephalopathy. The remaining 67.3% had chronic liver disease without hepatic encephalopathy at the time of assessment.

Table 3. Clinical Grading of Hepatic Encephalopathy According to West Haven Criteria

West Haven Grade	Frequency Among HE Patients, n = 49	Percentage Among HE Patients	Relative Pattern
Grade I	Not numerically specified	Not numerically specified	Less frequent than Grade II and Grade III
Grade II	19	38.8%	Most common presentation
Grade III	Not numerically specified	Not numerically specified	Second most frequent
Grade IV	Not numerically specified	Not numerically specified	Least frequent
Total HE cases	49	100.0%	—

Among the 49 patients diagnosed with hepatic encephalopathy, Grade II was the most common clinical presentation, accounting for 38.8% of HE cases, equivalent to approximately 19 patients. Grade III was the next most frequent category, followed by Grade I and Grade IV. This distribution suggests that most patients with hepatic encephalopathy are presented with clinically overt but potentially manageable neurological impairment rather than deep coma.

Table 4. Association of Selected Clinical Variables With Hepatic Encephalopathy

Variable	Association With Hepatic Encephalopathy	Statistical Significance
Increasing age	Significant association observed	p < 0.05
Longer duration of chronic liver disease	Significant association observed	p < 0.05
Gender	Not reported as statistically significant	Not specified
Hepatitis C-related chronic liver disease	Reported as frequent among HE cases	Not specified
Overall HE frequency	49/150 patients	32.7%

Table 5. Summary of Key Quantitative Findings

Outcome Measure	Result
Total patients analyzed	150
Mean age	51.84 ± 12.63 years
Male patients	92 / 150, 61.3%
Female patients	58 / 150, 38.7%
Hepatic encephalopathy frequency	49 / 150, 32.7%
Patients without hepatic encephalopathy	101 / 150, 67.3%
Most common HE grade	Grade II
Grade II among HE cases	19 / 49, 38.8%
Leading CLD etiology	Hepatitis C virus infection
Variables significantly associated with HE	Increasing age and longer disease duration

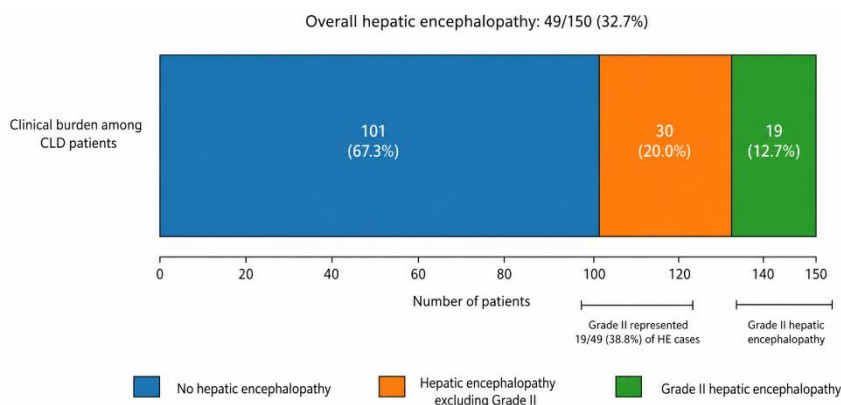


Figure 1. Emergency-Ward Burden of Hepatic Encephalopathy in Chronic Liver Disease

Figure 1 showed that among 150 patients with chronic liver disease presenting to the emergency ward, 49 patients (32.7%) had hepatic encephalopathy, while 101 patients (67.3%) had no clinical evidence of hepatic encephalopathy. Within the hepatic encephalopathy subgroup, Grade II hepatic encephalopathy accounted for 19 of 49 cases (38.8%), representing 12.7% of the entire chronic liver disease cohort. The figure highlights that nearly one-third of emergency presentations were complicated by hepatic encephalopathy, with Grade II forming the largest clearly quantified clinical burden among affected patients, suggesting a substantial proportion of patients presented with overt but potentially reversible neuropsychiatric impairment.

Overall, the results demonstrate a substantial burden of hepatic encephalopathy among emergency ward patients with chronic liver disease. The primary outcome showed that 32.7% of the enrolled patients had hepatic encephalopathy at presentation. The predominance of Grade II hepatic encephalopathy highlights that a large proportion of affected patients presented with clinically evident neuropsychiatric impairment before progression to coma. The significant associations with older age and longer disease duration suggest that cumulative hepatic dysfunction and disease chronicity may contribute meaningfully to the risk of hepatic encephalopathy in this population.

DISCUSSION

The present study demonstrated that hepatic encephalopathy was a frequent clinical complication among patients with chronic liver disease presenting to the emergency ward, affecting 49 of 150 patients, with an overall frequency of 32.7%. This finding indicates that nearly one in every three patients with chronic liver disease arriving in emergency care had clinically evident neuropsychiatric impairment consistent with hepatic encephalopathy. The observed burden is clinically important because hepatic encephalopathy is not only a marker of advanced hepatic dysfunction but also a major determinant of emergency admission, prolonged hospitalization, recurrent decompensation, caregiver burden, and increased short-term mortality. In an emergency setting, where patients often present with acute deterioration and limited prior documentation, early recognition of hepatic encephalopathy has direct implications for triage, airway protection, identification of precipitating factors, and timely initiation of treatment.

The frequency observed in this study is broadly consistent with previously reported international and regional estimates, where overt hepatic encephalopathy has been described in approximately 30–40% of patients with cirrhosis during the course of disease (12,13). Similar frequencies have also been reported in hospital-based studies from Pakistan, where hepatic encephalopathy has commonly been identified in nearly one-third of patients with decompensated chronic liver disease or cirrhosis presenting to tertiary care facilities (14). The comparable frequency in the present emergency-based population suggests that hepatic encephalopathy remains a recurring and clinically substantial presentation among chronic liver disease patients in local tertiary care settings. This pattern may reflect delayed presentation, high background prevalence of viral hepatitis-related cirrhosis, limited access to structured outpatient liver care, and recurrent exposure to precipitating factors such as infection, gastrointestinal bleeding, constipation, renal dysfunction, and electrolyte imbalance.

Grade II hepatic encephalopathy was the most frequent presentation among affected patients, accounting for 38.8% of hepatic encephalopathy cases. This grade generally reflects overt neuropsychiatric impairment, including lethargy, disorientation, behavioral change, or asterixis, while still representing a potentially reversible stage before progression to stupor or coma. The predominance of Grade II disease has practical clinical relevance because these patients often require urgent but structured management rather than intensive coma care alone. Recognition at this stage may allow correction of precipitating factors, initiation of ammonia-lowering therapy, monitoring of mental status progression, and prevention of aspiration, falls, or further neurological decline. The relatively lower representation of Grade IV disease suggests that many patients reached emergency care before the most advanced stage of encephalopathy, creating an opportunity for timely therapeutic intervention.

Increasing age showed a statistically significant association with hepatic encephalopathy, with significance reported at $p < 0.05$. Older patients with chronic liver disease may be more vulnerable to hepatic encephalopathy because of reduced physiological reserve, higher likelihood of sarcopenia, renal impairment, polypharmacy, infection, electrolyte disturbances, and impaired ammonia metabolism. Age-related cognitive vulnerability may also make neuropsychiatric manifestations more clinically apparent when hepatic decompensation occurs. This association is consistent with the broader understanding that hepatic encephalopathy is not determined by liver dysfunction alone, but by the

interaction of hepatic reserve, systemic inflammation, nutritional status, renal function, and neurological susceptibility (15). In emergency care, older patients with chronic liver disease should therefore receive careful assessment for subtle mental status changes, even when coma or severe disorientation is absent.

Longer duration of chronic liver disease was also significantly associated with hepatic encephalopathy at $p < 0.05$. This finding is biologically plausible because prolonged disease duration is often accompanied by progressive fibrosis, worsening portal hypertension, portosystemic shunting, reduced hepatocellular detoxification capacity, malnutrition, and recurrent episodes of decompensation. As chronic liver disease advances, ammonia clearance decreases and systemic inflammatory responses may amplify cerebral dysfunction, increasing the likelihood of overt encephalopathy (16). The association between disease chronicity and encephalopathy underscores the importance of longitudinal monitoring of chronic liver disease patients, particularly those with established cirrhosis, ascites, prior decompensation, or repeated emergency visits.

Hepatitis C virus infection was the leading etiology of chronic liver disease in the study population, reflecting the continued contribution of viral hepatitis to cirrhosis-related emergency presentations in Pakistan. This finding is consistent with the epidemiological profile of chronic liver disease in the region, where hepatitis C has historically represented a major driver of cirrhosis, portal hypertension, and hepatic decompensation (17). The predominance of hepatitis C-related chronic liver disease among emergency presentations also has public health implications. Although antiviral therapies have transformed hepatitis C management, delayed diagnosis, incomplete treatment coverage, reinfection risk, and limited surveillance for cirrhosis-related complications may continue to contribute to advanced liver disease presentations. Strengthening hepatitis screening, linkage to antiviral treatment, cirrhosis surveillance, and patient education may reduce the downstream burden of hepatic encephalopathy.

The pathophysiological basis of hepatic encephalopathy supports the clinical findings observed in this study. In chronic liver disease, impaired hepatic detoxification and portosystemic shunting promote accumulation of ammonia and other neurotoxins. Ammonia crosses the blood–brain barrier and is metabolized within astrocytes into glutamine, contributing to astrocyte swelling, oxidative stress, altered neurotransmission, and cerebral dysfunction. Systemic inflammation, infection, gut dysbiosis, gastrointestinal bleeding, renal dysfunction, and electrolyte abnormalities further worsen the neurocognitive effects of hyperammonemia (16,17). These mechanisms explain why patients with advanced or long-standing chronic liver disease may present acutely with altered sensorium in emergency settings, even when hepatic encephalopathy develops over a background of chronic hepatic insufficiency.

The study has several strengths. Its prospective emergency-based design allowed direct clinical assessment at the point of presentation, which is particularly relevant for a complication that often determines urgent management decisions. The use of West Haven criteria provided a standardized clinical framework for grading overt hepatic encephalopathy. The inclusion of adult patients with chronic liver disease presenting to a high-volume tertiary care emergency department also improves the practical relevance of the findings for acute-care physicians, internists, gastroenterologists, and emergency medicine teams. By estimating the frequency of hepatic encephalopathy in this setting, the study provides locally applicable evidence for planning emergency protocols, prioritizing early neurological assessment, and strengthening pathways for chronic liver disease decompensation.

Several limitations should be considered when interpreting the findings. The study was conducted at a single tertiary care hospital, which may limit wider generalizability to primary care, smaller hospitals, or community-based chronic liver disease populations. The sample size and study duration limited more detailed subgroup analysis. Minimal or covert hepatic encephalopathy may have been underrecognized because advanced neuropsychological testing was not performed in all patients. Serum ammonia levels were not consistently available, although hepatic encephalopathy remains primarily a clinical diagnosis

and ammonia levels do not always correlate directly with severity. Important precipitating factors, including infection, gastrointestinal bleeding, constipation, electrolyte imbalance, renal dysfunction, sedative exposure, and dehydration, were not analyzed separately. In addition, long-term outcomes such as mortality, recurrence of encephalopathy, length of hospital stay, readmission, and response to therapy were not assessed.

Despite these limitations, the findings emphasize that hepatic encephalopathy represents a substantial emergency-care burden among patients with chronic liver disease. The high frequency of overt disease, the predominance of Grade II encephalopathy, and the associations with older age and longer disease duration suggest that emergency departments should maintain a low threshold for structured neurological assessment in chronic liver disease patients. Incorporating standardized encephalopathy grading, early screening for precipitating factors, timely initiation of treatment, and referral for longitudinal liver care may improve short-term stabilization and reduce recurrent emergency presentations. Future multicenter studies with larger sample sizes, severity scoring using Child-Pugh or MELD classification, systematic precipitating-factor assessment, multivariable predictor modeling, and longitudinal follow-up would further clarify the epidemiology, determinants, and outcomes of hepatic encephalopathy in this population.

Overall, the study shows that hepatic encephalopathy is a common and clinically meaningful complication among chronic liver disease patients presenting to emergency care, with an observed frequency of 32.7% and Grade II disease forming the largest identified severity group. These results support the need for early recognition, standardized grading, and prompt management of hepatic encephalopathy in emergency settings, particularly among older patients and those with longer-standing chronic liver disease.

CONCLUSION

Hepatic encephalopathy was a common complication among patients with chronic liver disease presenting to the emergency ward, affecting 49 of 150 patients with an overall frequency of 32.7%. Grade II hepatic encephalopathy was the most frequent clinical grade, representing 38.8% of affected patients, indicating that a substantial proportion presented with overt but potentially reversible neuropsychiatric impairment. Increasing age and longer duration of chronic liver disease showed significant associations with hepatic encephalopathy, while hepatitis C virus infection remained the leading underlying etiology of chronic liver disease in this cohort. These findings highlight the need for early clinical recognition, standardized neurological assessment using West Haven criteria, and timely emergency management of hepatic encephalopathy among patients with chronic liver disease.

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