Middle East Research Journal of Nursing
ISSN 2789-8679 (Print) & ISSN: 2958-2016 (Online)
Frequency: Bi-Monthly
DOI: https://doi.org/10.36348/merjn.2025.v05i04.002

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Etiological Spectrum of Chronic Liver Disease in Pakistan: Correlation with MELD Score and Liver Function Tests

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Abstract: ***Background*:** Chronic Liver Disease (CLD) is a major global health issue, with hepatitis B and C viruses, alcohol abuse, and NAFLD being common causes. A study in Pakistan is investigating the relationship between various CLD causes, MELD scores, LFTs, and complications like hepatic encephalopathy and ascites, with HCV being the leading etiology in their preliminary findings. ***Methodology*:** A six-month cross-sectional study was conducted in four hospitals, enrolling 126 adult patients with chronic liver disease (CLD) through convenience sampling. Data was collected via questionnaires and medical record review. Statistical analysis using SPSS aimed to reveal associations between CLD etiologies and disease severity was done. Descriptive statistics were used to summarize the demographic and clinical characteristics. Chi-square tests were applied to examine associations between CLD etiologies and categorical clinical outcomes such as ascites and HE grades. ***Results*:** This study investigated 126 chronic liver disease (CLD) patients, revealing that Hepatitis C virus (51.6%) was the predominant etiology, followed by Hepatitis B (13.5%) and alcoholic liver disease (10.3%). The majority of patients were aged 41-60 years (55.7%), with a male-to-female ratio of 56:43. Hepatic encephalopathy was the most frequent symptom (80.2%), and a significant association was found between Hepatitis C and the development of ascites. MELD scores ranged from 3-39, but showed no statistical correlation with CLD duration or etiology. ***Conclusion*:** This study confirms that Hepatitis C is the leading cause of CLD in this cohort. The findings underscore the importance of etiology-specific considerations in managing CLD, despite MELD scores not showing a direct correlation with disease duration or cause in this population.

Keywords: Liver Diseases (D008107), Hepatitis C (D006526), Hepatic Encephalopathy (D006501), Ascites (D001201), Liver Diseases, Alcoholic (D008108), Non-alcoholic Fatty Liver Disease (D065626).

Research Paper

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How to cite this paper:
Hussain Ramzan *et al* (2025). Etiological Spectrum of Chronic Liver Disease in Pakistan: Correlation with MELD Score and Liver Function Tests. *Middle East Res J Nursing, 5*(4): 52-56.

Article History:
| Submit: 03.08.2025 |
| Accepted: 02.09.2025 |
| Published: 08.09.2025 |

INTRODUCTION

Chronic Liver Disease (CLD) is a leading cause of death across the world [1]. The hepatitis B and C viruses, alcohol abuse in liver disease, non-alcoholic fatty liver disease (NAFLD), autoimmune problems, Wilson's disease and hemochromatosis are all common causes of CLD [2]. Of the 4.8% of Pakistanis with CLD, nearly three out of four cases are linked to HCV [3]. Despite the utility of these parameters, the interplay between various CLD etiologies and their influence on MELD score, LFT derangements, and complication rates remains insufficiently elucidated, particularly in low- to middle-income countries [4].

The Model for End-Stage Liver Disease (MELD) score, based on serum bilirubin, serum creatinine, and international normalized ratio (INR), is widely employed for prognosticating disease severity and prioritizing liver transplant candidates [5]. International literature suggests that certain etiologies, such as HCV, may predispose to higher rates of hepatic encephalopathy (HE) and ascites, there is a paucity of local data evaluating these relationships in a Pakistani cohort. For example, a study in the United States found that patients with HCV-related cirrhosis had a 1.8-fold increased risk of developing ascites compared to those with NAFLD [6]. In contrast, NASH-related CLD cases have nearly doubled over the past decade globally, now accounting for 20–25% of CLD in some Western countries [7]. In Pakistan, although hepatitis B and autoimmune liver diseases are present, they account for significantly fewer cases—hepatitis B contributes to approximately 10–15% of CLD burden [8].

Internationally, studies have demonstrated the clinical relevance of the MELD score in predicting mortality and guiding liver transplantation decisions across various CLD etiologies [9]. Research found that hepatitis C-associated CLD linked to higher rates of hepatic encephalopathy and ascites compared to NAFLD [10]. Moreover, a meta-analysis from Europe showed that among patients awaiting liver transplantation, those with HCV had nearly twice the risk of decompensation compared to those with alcoholic or NAFLD-related cirrhosis. Hepatitis C is reported as the leading CLD cause in Pakistan, accounting for over 70% of cases [11].

This cross-sectional study seeks to investigate the clinical relationships between diverse CLD etiologies and key indicators, including MELD score, LFT values, and the presence of HE and ascites. By exploring these associations, this study aims to contribute to etiology-specific disease stratification and inform tailored management protocols for CLD in Pakistan. Enhanced understanding of how different causes of CLD influence clinical outcomes will assist clinicians in optimizing care, predicting disease trajectory, and allocating healthcare resources more effectively. This research gap underscores the need for etiology-specific clinical profiling of CLD patients in Pakistani populations to enhance diagnostic accuracy, therapeutic planning, and prognostication.

METHODOLOGY

A cross-sectional study was conducted over six months at four tertiary care hospitals, Nishtar Hospital Multan, Holy Family Hospital, Benazir Bhutto Hospital, and District Headquarters Hospital, Rawalpindi. The study aimed to investigate the clinical relationship between different etiologies of chronic liver disease (CLD) and key clinical parameters, including MELD score, liver function tests (LFTs), hepatic encephalopathy (HE), and ascites. A total of 126 patients were recruited using non-probability convenience sampling. Eligibility criteria included patients of all ages diagnosed with CLD based on clinical, laboratory, and radiological evidence, with MELD scores and complete LFT data available within the last six months. Exclusion criteria include those patients who are unable to give consent. Patients with acute liver failure, history of liver transplantation, or missing laboratory data were excluded.

Data collection involved a structured, interview-based questionnaire complemented by a review of patient medical records. Demographic variables, etiology of CLD, MELD scores, LFT parameters (serum bilirubin, creatinine, INR), and presence/absence of HE and ascites were recorded.

Privacy and data confidentiality were strictly maintained throughout the study. Data were entered and analyzed using IBM SPSS version 25. Descriptive statistics were used to summarize the demographic and clinical characteristics. Chi-square tests were applied to examine associations between CLD etiologies and categorical clinical outcomes such as ascites and HE grades. For continuous variables like MELD scores and LFTs, comparisons across etiological groups were planned using non-parametric alternatives as appropriate based on data distribution.

This methodology provides a systematic framework to elucidate the associations between CLD etiology and disease severity, offering insights relevant for clinical risk stratification in the Pakistani context.

Ethical Considerations:

Ethical consent was obtained from the ethical board meeting of Nishtar Medical University, Multan. Participation in the study was voluntary, and participants had the right to withdraw at any point without any consequence. All data were anonymized, and participant identities were kept confidential. Data was stored securely and was only accessible to the research team.

RESULTS

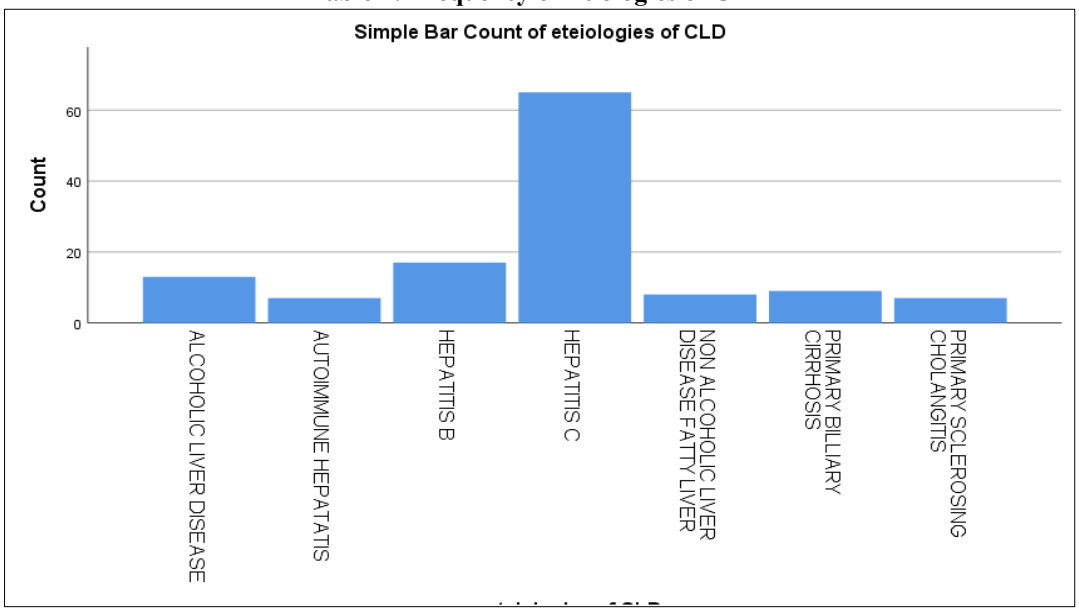
A total of 126 patients were included in the study, among the individuals with CLD, the largest proportion (55.7%) fell within the age group of 41-60 years old with mean being 50 years old. The male-to-female ratio was 56:43. Demographics and operation details are mentioned in Table 1.

Table 1: Demographic Variables

Patient Demographics		Frequency	Percentage
Age group (Years)	13-40 Yrs	32	25.6
	41-60 Yrs	67	55.7
	60-90 Yrs	27	21.6
Gender	Male	71	56
	Female	55	43
Duration of CLD (in Years)	1-5 Years	124	98.9
	5-10 Years	1	0.8
	10-15 Years	1	0.8

Analysis revealed that Hepatitis C virus (HCV) was the leading cause of CLD, accounting for 51.6% of cases. This was followed by Hepatitis B virus (HBV) at 13.5% and alcoholic liver disease at 10.3%. Additional etiologies included autoimmune hepatitis, non-alcoholic fatty liver disease (NAFLD), primary sclerosing cholangitis (PSC), and primary biliary cirrhosis (PBC). The distribution of etiologies is summarized in Table 2.

Table 2: Frequency of Etiologies of CLD



Among the symptoms, the most common occurrence was hepatic encephalopathy with a total of 101 patients (80.2%) experiencing at least one episode of hepatic encephalopathy since the onset of CLD, while 25 patients (19.8%) had not experienced any HE episodes. This was followed by development of ascites. Out of the total participants, 78 patients (61.9%) had no ascites, while 48 patients (38.1%) presented with ascites.

A statistically significant association was found between the development of ascites and the underlying cause of CLD ($p = 0.049$, $p < 0.05$). Patients with hepatitis C tend to develop ascites more frequently as compared to any other etiology. Therefore, Hepatitis C leading to CLD and in return ascites was reported in 34 patients, followed by Hepatitis B in 4 patients. Table 3 demonstrates the presence of Ascites in association to different etiologies of CLD.

Table 3: Ascites in relation to etiologies of CLD

Co-relation of etiologies of CLD with development of Ascites		Frequency	
		NO	YES
Etiologies	HPV C	31	34
	HPV B	13	04
	Alcoholic Liver Disease	10	03
	Autoimmune Hepatitis	06	01
	Non-Alcoholic Hepatitis Disease	05	03
	Primary Sclerosing Cholangitis	06	01
	Primary Biliary Cirrhosis	07	02

MELD scores were calculated, and ranged from 3 to 39, with a score of 3 reported in 2 patients (1.6%) and the highest score of 39 reported in 1 patient (0.8%). No significant statistical relationship was found between MELD scores and the duration of CLD. Additionally, a chi-square test was applied to assess the association between MELD score severity and the etiology of CLD. The test yielded a p-value of 0.9 ($p > 0.05$), indicating no statistically significant relationship between MELD score and underlying CLD etiology.

DISCUSSION

One of the main causes of death and morbidity worldwide is cirrhosis. In 2016, it accounted for 2.2% of deaths and 1.5% of disability-adjusted life years globally, ranking as the 11th greatest cause of mortality and the 15th leading cause of morbidity [12]. There are different causes of alcohol-induced liver injury, such as viral hepatitis and non-alcoholic fatty liver disease (NAFLD), which contribute to liver dysfunction, chronic liver disease (CLD) [13]. Model for End-Stage Liver Disease (MELD) score and standard liver function tests (LFTs) are frequently used for clinical assessment and prognostication of chronic liver disease [14]. The extent to which different causes of CLD that affect MELD scores and LFT patterns is still not well understood, so effective management of disease progression based on etiology-specific profiles, early diagnosis, and accurate clinical interpretation are all hampered by this gap. Therefore, to improve accuracy and focused treatment approaches, the clinical link between CLD etiologies, MELD scores, and LFT data is required.

The summary of the results analyzed shows that Hepatitis C is the most common causes cause of chronic liver disease followed by Hepatitis B, then Alcoholism, whereas non alcoholic fatty liver disease, primary biliary cholangitis, primary sclerosing cholangitis, autoimmune hepatitis were less common causes. The development of ascites varied with etiology of chronic liver disease but was most commonly found in HCV. No significant relationship is found between L=MELD score and duration and etiology of CLD.

The MELD score was a good indicator of 3- and 6-month mortality in alcoholic hepatitis (c-statistic $0.83) and 1-year mortality in chronic liver disease (c-statistics for all subgroups $0.75) [15]. A retrospective cohort study conducted in the USA showed that Alcoholic liver disease was diagnosed in most of the patients of chronic liver disease and HCV was the second common disease identified in CLD (15).In terms of alcohol-related cirrhosis, the Americas (17%–52%), Oceania (15%–37%), and Europe (16%–78%) had the highest prevalence, while Asia had the lowest (0%–41%) [16]. A cross-sectional study in India also showed that Alcoholism is the most common cause of CLD whereas viral infections are the second most common cause [17]. While the incidence of cirrhosis caused by alcohol and nonalcoholic fatty liver disease is quickly rising, the burden of cirrhosis caused by hepatitis B and hepatitis C virus infection is declining globally [16]. A meta-analysis conducted by Services Hospital Pakistan showed that hepatitis C is the commonest cause of cirrhosis in patients of end-stage liver disease while hepatitis B is the second most common cause of it [18]. The results are in line with our study which shows that 51.6% of the cases studied were diagnosed with Hepatitis C, 13.5% with Hepatitis B, and 10.3% with alcoholism. As alcohol consumed is not commonly used in Pakistan as compared to USA. Hepatic encephalopathy and ascites were substantially linked to an increase in the MELD score at three months [19]. The most common side effect in cirrhotic patients is ascites and approximately 75% of ascites develop due to cirrhosis and portal hypertension [16].

Liver cirrhosis continues to be a major global public health concern. Variations in risk factors, age, gender, and regional inequities should all be taken into consideration in effective disease management, prevention, and treatment efforts [20]. The purpose of this study is to improve the outcome and management of chronic liver disease. It should be mandatory to calculate the MELD score during the diagnosis and follow-up of patients of chronic liver disease. Multidisciplinary clinics for cirrhotic patients and a team-based approach will help patients manage more effectively.

Limitations

This study has several limitations. The relatively small sample size and use of convenience sampling may limit the generalizability of the findings. As the data was collected from select hospitals in Punjab, it may not reflect the broader population across Pakistan. The cross-sectional design prevents assessment of causality or disease progression over time. Additionally, reliance on self-reported data introduces the potential for recall bias. Important clinical variables such as nutritional status, comorbidities, and medication history were not included, which could influence MELD scores and complication rates. In our study the co-morbid conditions of the patients (diabetes, CKD, hypertension, Heart disease) were not thoroughly explored, and the pediatric population was excluded.

CONCLUSION

Hepatitis C virus emerged as the predominant etiology of chronic liver disease in this cohort, significantly associated with the development of ascites. While the MELD score remains a valuable prognostic tool, no clear correlation with disease duration or etiology was observed. These findings highlight the need for etiology-specific management strategies and further multicenter studies across Pakistan to enhance clinical risk assessment in CLD.

Conflict of Interest:

The authors declare no conflicts of interest, financial or otherwise, that could have influenced the research, affirming that this study was conducted independently and without any commercial or financial relationships that could be perceived as a potential conflict of interest.

Funding: The authors have received no funding from an external source.

Acknowledgement:

The authors would like to express their sincere gratitude to the participants who participated in this study and the healthcare professionals and staff who facilitated data collection. We also appreciate the support and resources provided by Nishtar Medical University, Multan, Pakistan, which enabled us to conduct this research.

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