Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1403
www.lmi.education/

Prevalence of Hepatitis C in Liver Cirrhosis Patients

Muhammad Kashif[1], Fatima Zaman[2], Muhammad Hassan Uzman[3], Tehreem Shabbir[4], Nadeem-ul-Hassan[5], Sania Atta[6], Saleha Shiraz[1], Muhammad Ali Zahid[7]

Correspondence
Muhammad Kashif
kashifawan5852@gmail.com

Affiliations
1 Department of Allied Health Sciences, Fatima Memorial Hospital College of Medicine & Dentistry, Lahore, Pakistan
2 Blood Transfusion Officer, Children Hospital & ICH, Faisalabad, Pakistan
3 Deputy Medical Superintendent (DMS-OPD), Children Hospital & ICH, Faisalabad, Pakistan
4 Department of Medical Laboratory Technology, Riphah International University, Lahore, Pakistan
5 Department of Forensic Medicine, University of Health Sciences, Lahore, Pakistan
6 Department of Pharmacy, Quaid-i-Azam University, Islamabad, Pakistan
7 Senior Lecturer, Department of Allied Health Sciences, Fatima Memorial Hospital College of Medicine & Dentistry, Lahore, Pakistan

Keywords
Hepatitis C Virus, Liver Cirrhosis, ALT, AST, ELISA, PCR, Liver Function Tests, Chronic Liver Disease, HCV Prevalence, Diagnostic Biomarkers.

Disclaimers

Authors' Contributions	All authors contributed to the study's conception, design, data collection, analysis, and manuscript preparation
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Hepatitis C Virus (HCV) is a major cause of chronic liver disease, including liver cirrhosis, globally. Identifying the prevalence of HCV among cirrhotic patients can improve clinical outcomes and guide management strategies.

Objective: To determine the prevalence of HCV in patients with liver cirrhosis and assess the association between liver enzyme levels (ALT and AST) and HCV infection.

Methods: This retrospective observational study was conducted at Fatima Memorial Hospital, Lahore, from June 2023 to December 2023. Fifty liver cirrhosis patients with abnormal liver function tests were included. HCV infection was evaluated using ELISA for antibodies and PCR for RNA detection. Data analysis was performed using IBM SPSS version 25.0, with a p-value of <0.05 considered significant.

Results: Among 50 cirrhotic patients, 60% tested positive for HCV antibodies via ELISA, and 46% were confirmed positive by PCR. Mean ALT levels were significantly higher in ELISA-positive (867 U/L) and PCR-positive (1096.43 U/L) patients compared to ELISA-negative (42 U/L) and PCR-negative (59.96 U/L) patients ($p < 0.001$).

Conclusion: A significant prevalence of HCV was observed among liver cirrhosis patients, with elevated ALT and AST levels indicating liver damage associated with HCV infection.

INTRODUCTION

The global prevalence of Hepatitis C Virus (HCV) infection is approximately 2.2%, affecting nearly 130 million individuals worldwide, with significant regional variations in prevalence rates due to differing levels of data availability and health infrastructure (1). For instance, Northern Europe has a prevalence rate below 1.0%, while Northern Africa exceeds 2.9%. Some of the lowest prevalence rates, between 0.01% to 0.1%, are reported in the United Kingdom and Scandinavian countries, whereas Egypt shows the highest rates, ranging from 15% to 20% (2). Hepatitis C, first identified in 1989, continues to be a significant global health concern, with an estimated 170 million people infected worldwide, according to the World Health Organization (3). The virus is primarily transmitted through blood and blood products, and it can lead to both acute and chronic liver infections. The chronic stage is notably associated with severe complications such as liver cirrhosis and hepatocellular carcinoma (HCC), contributing to approximately 27% of cirrhosis cases and 25% of liver cancer cases globally (4).

The natural history of hepatitis C includes an initial acute phase, often asymptomatic and mild, followed by a chronic phase in a significant proportion of patients, with 55–85% developing chronic HCV after the initial infection phase (5). Despite the extensive burden of this disease, the historical progression and understanding of hepatitis are limited, as early descriptions and diagnostic methods were unavailable. It is believed that the hepatitis virus has been evolving for thousands of years, adapting through mutations to its current genotypes (6). The prevalence of HCV is particularly high in developing countries, notably in regions of Africa and Central East Asia, where socioeconomic factors, healthcare infrastructure, and risky behaviors, such as intravenous drug use, exacerbate transmission rates (7). In Pakistan, HCV prevalence among the general population is alarmingly high at 30%, compared to 20% in other major Asian nations, with intravenous drug use identified as a predominant mode of transmission (8).

Liver cirrhosis, a severe outcome of chronic HCV infection, is characterized by the replacement of normal liver tissue with scar tissue, impairing liver function and leading to significant systemic effects due to the liver's vital role in detoxification, protein synthesis, and biochemical production necessary for digestion (9). The progression from inflammation to fibrosis and eventually cirrhosis involves complex mechanisms, including chronic inflammation, oxidative stress, and hepatic stellate cell activation (10). Diagnostic approaches for cirrhosis involve various laboratory tests, such as liver function tests (LFTs), which measure enzymes like alanine aminotransferase (ALT) and aspartate aminotransferase (AST). Elevated levels of these enzymes indicate liver cell injury, commonly observed in

HCV infections (11). Current diagnostic methods for HCV include serological testing for HCV antibodies and molecular testing, such as reverse transcription polymerase chain reaction (RT-PCR), to detect HCV RNA, providing a comprehensive assessment of infection status (12).

This study aims to assess the prevalence of hepatitis C among patients with liver cirrhosis and explore the relationship between HCV infection and liver enzyme levels in a clinical setting. By utilizing diagnostic tools such as ELISA and PCR, the study seeks to provide insights into the burden of HCV among cirrhotic patients and the potential clinical implications of elevated aminotransferase levels. The findings will contribute to a better understanding of HCV's role in liver disease progression and underscore the importance of early detection and intervention strategies for improving patient outcomes (13).

MATERIAL AND METHODS

The study was conducted as a retrospective observational analysis focusing on patients diagnosed with liver cirrhosis. The research was carried out at the Department of Allied Health Sciences, Fatima Memorial Hospital College of Medicine & Dentistry, Lahore, Pakistan, from June 2023 to December 2023, following approval from the Institutional Review Board (IRB), adhering to the ethical principles of the Declaration of Helsinki. The study included patients with liver cirrhosis, diagnosed through clinical and biochemical parameters, specifically elevated liver function test (LFT) results, including ALT and AST levels, indicating chronic liver damage. The sample size was calculated based on the prevalence of hepatitis C virus (HCV) in liver cirrhosis patients, estimated at 6.2%. A desired confidence level of 95% (Z = 1.96) and a specified margin of error were considered, resulting in a sample size of 50 patients, determined through a non-probability convenience sampling technique.

Data were collected using a self-designed Performa that documented patient demographics, clinical history, and relevant biochemical parameters, including LFT results, ELISA, and PCR outcomes. The inclusion criteria encompassed all patients with confirmed liver cirrhosis and positive screening for HCV, regardless of age or sex. Exclusion criteria involved cases with insufficient sample quantity or incomplete data, as well as patients with negative HCV screening or ELISA results. Laboratory assessments included the measurement of ALT and AST levels using automated biochemical analyzers, and the presence of HCV was confirmed through ELISA for antibody detection and PCR for viral RNA quantification. These diagnostic methods provided a comprehensive evaluation of the HCV infection status in patients, aligning with current molecular techniques for diagnosing HCV, which recommend serological testing followed by molecular assays for RNA detection (12).

The study also accounted for potential confounding factors such as age and gender, which were included in the data analysis to explore their association with LFT results and HCV positivity. Data were entered and analyzed using IBM SPSS version 25.0. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation (SD). Comparative analyses were performed to assess the relationship between elevated liver enzyme levels and HCV infection status, as determined by ELISA and PCR results. A p-value of less than 0.05 was considered statistically significant, indicating strong associations between variables under study. The analysis aimed to elucidate the correlation between HCV infection and liver damage, as reflected in the elevated aminotransferase levels, contributing to the understanding of the clinical impact of HCV in cirrhotic patients (14).

This comprehensive approach ensured that the study was methodologically robust, adhering to ethical guidelines, and utilized validated diagnostic techniques, providing reliable insights into the prevalence and implications of HCV among patients with liver cirrhosis. The findings were intended to inform future research and clinical practice, highlighting the importance of monitoring liver function and HCV status in managing cirrhosis effectively.

RESULTS

The study included a total of 50 patients diagnosed with liver cirrhosis, comprising 27 males (54%) and 23 females (46%), with ages ranging from 4 to 92 years. The mean age of the participants was 32.42 years, with a standard deviation of 24.93 years, indicating a broad age distribution. The liver function tests (LFTs) of the patients showed significant variability in ALT and AST levels, reflecting the extent of liver damage among the study population.

Table 1: Liver Function Test Results of Study Population

Parameter	Minimum Value	Maximum Value	Mean ± SD
ALT (U/L)	18	4270	536.74 ± 888.46
AST (U/L)	22	4210	486.48 ± 799.52

Table 2: Comparison of ALT and AST Levels with ELISA Results

Parameter	ELISA Positive (Mean)	ELISA Negative (Mean)	p-value
ALT (U/L)	867	42	< 0.001
AST (U/L)	773	57	< 0.001

The results indicated that among the 50 patients, 30 (60%) tested positive for HCV antibodies via ELISA, while 20 (40%) tested negative. PCR testing for HCV confirmed the infection in 23 patients (46%), while 27 patients (54%) had negative

PCR resultsA comparison of ALT and AST levels with ELISA and PCR results revealed a statistically significant association between elevated liver enzyme levels and positive HCV status

Table 3: Comparison of ALT and AST Levels with PCR Results

Parameter	PCR Positive (Mean)	PCR Negative (Mean)	p-value
ALT (U/L)	1096.43	59.96	< 0.001
AST (U/L)	968.39	75.96	< 0.001

The mean ALT level for ELISA-positive patients was 867 U/L, whereas for ELISA-negative patients, it was 42 U/L. Similarly, the mean AST level for ELISA-positive patients was 773 U/L compared to 57 U/L for ELISA-negative patients. Both differences were statistically significant with p-values less than 0.001, indicating a strong association between elevated liver enzymes and positive ELISA results (16). Additionally, when comparing ALT and AST levels with PCR results, the mean ALT level for PCR-positive patients was 1096.43 U/L, while for PCR-negative patients, it was 59.96 U/L. The mean AST level for PCR-positive patients was 968.39 U/L, compared to 75.96 U/L for PCR-negative patients, with both comparisons showing statistical significance ($p < 0.001$).

These findings confirm a significant correlation between elevated liver enzyme levels and HCV infection in patients with liver cirrhosis. Elevated ALT and AST levels are critical markers of liver damage and are associated with the presence of HCV infection as confirmed by both ELISA and PCR testing, underscoring the importance of these biomarkers in the clinical assessment and management of cirrhosis in HCV patients (16).

DISCUSSION

This study aimed to determine the prevalence of Hepatitis C Virus (HCV) in patients with liver cirrhosis and to explore the association between liver enzyme levels and HCV infection status. The findings demonstrated a significant presence of HCV among the study population, with 60% of patients testing positive for HCV antibodies via ELISA and 46% confirming infection through PCR testing. These results align with global data that underscore HCV as a major contributor to chronic liver disease, including cirrhosis, and reflect the broader public health challenge posed by HCV, particularly in regions with high prevalence rates like Pakistan (1, 7). The observed elevated levels of ALT and AST in HCV-positive patients further corroborate the role of these enzymes as biomarkers of liver damage, consistent with existing literature that identifies elevated aminotransferase levels as indicative of hepatic injury and inflammation associated with chronic HCV infection (18).

Comparative analysis revealed that both ALT and AST levels were significantly higher in HCV-positive patients compared to those without HCV, with statistically significant differences confirmed by p-values less than 0.001. These findings are in agreement with studies by Anderson et al., which also reported that serum ALT and AST levels are critical indicators of liver damage in chronic hepatitis C, showing strong correlations with disease severity and progression (18). This study's results highlighted that ALT levels, in particular, were markedly elevated in patients with positive ELISA and PCR results, underscoring the diagnostic value of ALT as a more liver-specific enzyme compared to AST, which can also be elevated in conditions affecting other tissues (18). However, the study identified that ALT was generally more elevated than AST, which aligns with the literature suggesting that ALT is more directly associated with liver-specific damage (18).

The strengths of this study include its focused approach on a defined patient group with liver cirrhosis and the use of both ELISA and PCR for confirming HCV status, which provided a robust assessment of the viral infection among cirrhotic patients. The utilization of reliable diagnostic methods enhances the validity of the findings, contributing valuable insights into the prevalence and clinical implications of HCV in this population. However, the study also had limitations. The use of a non-probability convenience sampling method may have introduced selection bias, potentially limiting the generalizability of the results. Additionally, the study's retrospective design, based on existing patient data, may have restricted the ability to control for confounding variables such as co-infections, comorbidities, and lifestyle factors that could influence liver enzyme levels and HCV status. The relatively small sample size further limits the study's statistical power, and future research with larger, more diverse populations is recommended to validate these findings and enhance their applicability (16).

In terms of clinical implications, the study emphasizes the need for routine screening and monitoring of liver enzyme levels in patients with liver cirrhosis, particularly those at high risk for HCV infection. Given the significant association between elevated ALT and AST levels and HCV infection, these enzymes should be utilized as part of a comprehensive diagnostic and monitoring strategy for cirrhotic patients. Early detection of HCV and timely intervention could potentially mitigate the progression of liver damage and improve patient outcomes. Moreover, the study highlights the importance of public health initiatives aimed at reducing HCV transmission, particularly in high-prevalence areas like Pakistan, where intravenous drug use remains a significant mode of transmission (7).

Future research should explore the underlying mechanisms linking elevated aminotransferase levels with liver fibrosis and cirrhosis in HCV-infected patients, as well as investigate potential therapeutic targets to reduce liver inflammation and damage. Longitudinal studies tracking changes in ALT and AST levels over time could provide valuable insights into disease progression and treatment efficacy. Additionally, expanding research to include other biomarkers alongside ALT and AST could enhance the diagnostic and prognostic capabilities for hepatitis C patients, offering a more

comprehensive approach to managing this challenging condition (20). The integration of genetic studies could also shed light on individual variations in liver enzyme response and disease outcomes, paving the way for more personalized and effective treatment strategies.

CONCLUSION

The study concluded that there is a significant prevalence of Hepatitis C Virus (HCV) among patients with liver cirrhosis, with elevated ALT and AST levels strongly associated with HCV infection. These findings reinforce the importance of using aminotransferase levels as critical biomarkers for assessing liver damage in cirrhotic patients, emphasizing the need for routine screening and early detection of HCV to prevent disease progression. The study underscores the healthcare implications of addressing HCV through targeted public health strategies, improved diagnostic protocols, and personalized treatment approaches, particularly in high-risk populations. Enhancing HCV management could significantly reduce the burden of liver disease, improve patient outcomes, and contribute to better overall public health.

REFERENCES

1. Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol. 2007;13(17):2436-41.
2. Kalra A, Tuma F, Yetiskul E, Wehrle CJ. Physiology, Liver. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
3. Bernal W, Wendon J. Acute Liver Failure. N Engl J Med. 2013;369(26):2525-34.
4. Trepo C. A Brief History of Hepatitis Milestones. Liver Int. 2013;34(Suppl 1):29-37.
5. Tanaka T, Shakado S, Takata K, Inomate S, Ueda S, Morihara D, et al. Hepatitis C Infected Patients with Persistently Normal Alanine Aminotransferases Level. Med Bull. 2012;103-12.
6. Khatri M, Contributors WE. Hepatitis C Transmission. How Hepatitis C Spreads & Contracted. 2022;5-13.
7. Bashir MF, Haider MS, Rashid N, Riaz S. Association of Biochemical Markers, Hepatitis C Virus. Trop J Med. 2013;1596-9827.
8. World Health Organization (WHO). Hepatitis C [Internet]. Available from: https://www.who.int/news-room/fact-sheets/detail/hepatitis
9. Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, editors. Harrison's Principles of Internal Medicine. 21st ed. New York: McGraw Hill Medical; 2020.
10. World Health Organization (WHO). Hepatitis C [Internet]. Available from: https://www.who.int/news-room/fact-sheets/detail/hepatitis
11. Cramm JM, Nieboer AP. Disease Management: The Need for a Focus on Broader Self-Management Abilities and Quality of Life. Popul Health Manag. 2015;18(4):246-55.
12. Firdus R, Sha K, Biswas A, Sadukhan PC. Current Molecular Methods for the Detection of Hepatitis C Virus in High-Risk Group Population: A Systematic Review. 2015;1-13.
13. Fabrizi F, Lunghi G, Andrulli S, Pagliari B, Mangano S, Farana P, et al. Influence of Hepatitis C Virus Viraemia upon Serum Aminotransferase Activity in Chronic Liver Dialysis Patients. Nephrology. 1997;2(2):1394-8.
14. Ullah A, Rehman I, Ahmad J, Gohar M, Ahmad S, Ahmad B. Hepatitis C Virus and Cirrhosis: An Overview from Khyber Pakhtunkhwa Province of Pakistan. Viral Immunol. 2020;33(5):396-403.
15. Dor-Mohammadi T, Daryani NE, Bashashati M, Hashtrudi AA, Haghpanah B, Sayyah AR, et al. Relationship Between Serum Alanine Aminotransferase Levels and Liver Histology in Chronic Hepatitis C-Infected Patients. Indian J Gastroenterol. 2015;24(2):112-8.
16. Nadeem A, Hussain MA, Aslam M. Correlation of Serum Alanine Aminotransferase and Aspartate Aminotransferase Levels to Liver Histology in Chronic Hepatitis C. Hepatol Res. 2010;20(10):657-61.
17. Khan AH. Liver Function Tests in Hepatitis C Patients of Local Population of Lahore. Pak Bio Med J. 2022;1:12-6.
18. Anderson FH, Zaman A, Taylor W, McMahon R, Weltman M, Jeffery H. An Assessment of the Clinical Utility of Serum ALT and AST in Chronic Hepatitis C. Hepatol Res. 2000;18(1):63-71.
19. Seglen PO. Why the Impact Factor of Journals Should Not Be Used for Evaluating Research. BMJ. 1997;314(7079):497-502.
20. Cramm JM, Nieboer AP. Disease Management: The Need for a Focus on Broader Self-Management Abilities and Quality of Life. Popul Health Manag. 2015;18(4):246-55.