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ORIGINAL ARTICLE

Exploring Cardiac Dysfunction in Chronic Liver Disease: A Comprehensive Investigation

[1]Anand Kumar Pandey, [2]Sharad Dayadhan Sonawane

[1]Professor, [2]Associate Professor, Department of General Medicine, Major S D Singh Medical College, Farukkhabad, Uttar Pradesh, India

ABSTRACT:

Background: The study you mentioned has the aim of determining the prevalence of cardiac dysfunctions in patients with chronic liver disease. This is important because cardiac issues can be a significant cause of mortality in such patients, particularly those who undergo surgical procedures like Transjugular Intrahepatic Portosystemic Shunt (TIPS) or liver transplantation (LT). The objectives of the study likely involve assessing and quantifying the occurrence of cardiac dysfunctions in this patient population, which can help in understanding the risk factors and improving clinical management for better outcomes. **Methods**: This research was carried out as an observational investigation, involving a cohort of 100 patients diagnosed with chronic liver disease. Subsequently, these patients underwent interviews to collect their demographic information and details about their symptoms and presentation. Comprehensive physical examinations, cardiological assessments through ECG and 2D ECHO, as well as blood tests, were then conducted for all the patients. **Results**: The average age of patients who did not exhibit cardiac dysfunction was 40.5 years, while those with cardiac dysfunction had a higher average age of 46.26 years. **Conclusion**: A substantial number of patients with chronic liver disease exhibit subclinical cardiac dysfunctions. These dysfunctions carry a heightened risk of cardiovascular complications, particularly when these patients undergo surgical interventions like TIPS or liver transplantation. Consequently, there is a pressing demand for a thorough cardiac evaluation and the establishment of standardized diagnostic procedures for individuals with liver cirrhosis, particularly those undergoing TIPS or liver transplantation procedures.

Keywords: cirrhosis, cardiac dysfunction, QT prolongation.

Corresponding author: Sharad Dayadhan Sonawane, Associate Professor, Department of General Medicine, Major S D Singh Medical College, Farukkhabad, Uttar Pradesh, India

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INTRODUCTION

Cirrhosis represents a significant global health challenge, contributing substantially to both mortality and morbidity. The prevalence and underlying causes of cirrhosis exhibit variations across different geographical regions and demographic groups.[1] As a leading cause of liver-related deaths worldwide, cirrhosis marks the advanced stage of liver fibrosis, leading to architectural distortion within the liver.In its early stages, cirrhosis is categorized as compensated, displaying relatively few noticeable symptoms. However, when decompensation occurs, manifesting as issues like ascites, esophageal variceal bleeding, hepatic encephalopathy, and elevated bilirubin levels, patients seek medical attention. Decompensation substantially increases the morbidity and mortality associated with liver cirrhosis, with one-year case fatality rates reaching as high as 80%, depending on the underlying cause[2,3].The World Health Organization (WHO) estimates that cirrhosis contributes to 1.1% of all deaths globally. Various well-known etiologies of cirrhosis include fatty liver disease (both alcoholic and non-alcoholic), viral infections (hepatitis B, hepatitis C, and hepatitis D), autoimmune conditions (autoimmune hepatitis, primary biliary cirrhosis, primary sclerosing cholangitis, and IgG4 cholangiopathy), chronic biliary diseases (resulting from recurrent bacterial cholangitis or bile duct obstruction), storage disorders (like Wilson's disease, hemochromatosis, and alpha-1 antitrypsin deficiency), cardiovascular factors (such as Budd-Chiari syndrome and Osler's disease), and rare causes like medication-related and porphyria-induced cirrhosis.Studies conducted in India have demonstrated that alcohol consumption is a significant factor in cirrhosis, contributing to a substantial portion of cases. One study from central India, in particular, found that 45% of all cirrhosis cases were attributable to alcohol . Decompensated cirrhosis can result in hepatic dysfunction, portal hypertension, or a combination of both, and these factors are responsible for various complications, including ascites, varices, coagulation disorders, spontaneous bacterial peritonitis, hepatic encephalopathy, hepatorenal syndrome, hepatopulmonary syndrome, and hepatocellular carcinoma[4].The recognition of cardiomyopathy in cirrhotic patients dates back to the 1960s, although it was initially misattributed to alcoholic cardiotoxicity. For individuals with chronic liver disease (CLD) but no known cardiac dysfunction, the term "cirrhotic cardiomyopathy" was introduced. This condition encompasses both systolic and diastolic heart dysfunctions, along with electrophysiological abnormalities[5].Additionally, the term "Hyperdynamic syndrome" describes a state characterized by increased cardiac output, heart rate,

decreased peripheral vascular resistance, and a decrease in mean arterial blood pressure. This condition is associated with heightened activity and production of endogenous vasodilators, including nitric oxide (NO), carbon monoxide (CO), and cannabinoids.It has been observed that CLD patients with subclinical cardiac dysfunctions are at a heightened risk of experiencing cardiovascular complications during or after medical procedures. This elevated risk results in significantly increased postoperative morbidity and mortality, particularly in patients undergoing liver transplantation.These findings underscore the importance of conducting thorough cardiovascular assessments in individuals with chronic liver disease, especially those slated for surgical procedures such as TIPS (transjugular intrahepatic portosystemic shunt) and liver transplantation (LT)[6]. Furthermore, it emphasizes the need for the establishment of standardized diagnostic protocols for these patients to enhance their overall care and safety.

MATERIALS AND METHODS

This research was carried out as an observational study and involved 100 patients diagnosed with chronic liver disease (CLD)[7]. The study included patients who willingly participated and excluded those who declined to take part. Patients with clinical symptoms and laboratory test results indicative of chronic liver disease were eligible for inclusion.However, patients with additional medical conditions such as ischemic heart disease, valvular heart disease, conduction defects, cardiac arrhythmias, congenital heart defects, type 2 diabetes, hypertension, hypothyroidism, and hyperthyroidism were excluded from the study. This exclusion criterion aimed to ensure that the study focused specifically on chronic liver disease and its associations[8,9].Following the acquisition of ethical clearance from the Institute's Ethical Committee, written consent was obtained from the patients or their family members. Subsequently, a comprehensive general and physical examination was conducted for all patients. This examination included the measurement of height, weight, BMI, and abdominal circumference for each patient. Baseline vital signs such as pulse rate, blood pressure, respiratory rate, and SPO2 levels were assessed and recorded[10].

Further, all patients underwent a series of detailed medical investigations, including Complete Blood Count (CBC), Liver Function Tests (LFT), Renal Function Tests (RFT), lipid profile analysis, Random Blood Sugar (RBS) measurement, analysis of ascitic fluid (if applicable), Electrocardiogram (ECG), and two-dimensional echocardiography (2D ECHO). The findings from these investigations were meticulously documented in a structured questionnaire for further analysis.

RESULTS

Table 1: Age distribution of study participants

Age Group (Years)	Without cardiac dysfunction	With Cardiac Dysfunction
≤ 20	0	0
21-30	10	2
31-40	14	12
41-50	14	14
51-60	16	10
≥60	2	6
$\chi 2$	4.71	
P Value	0.318	

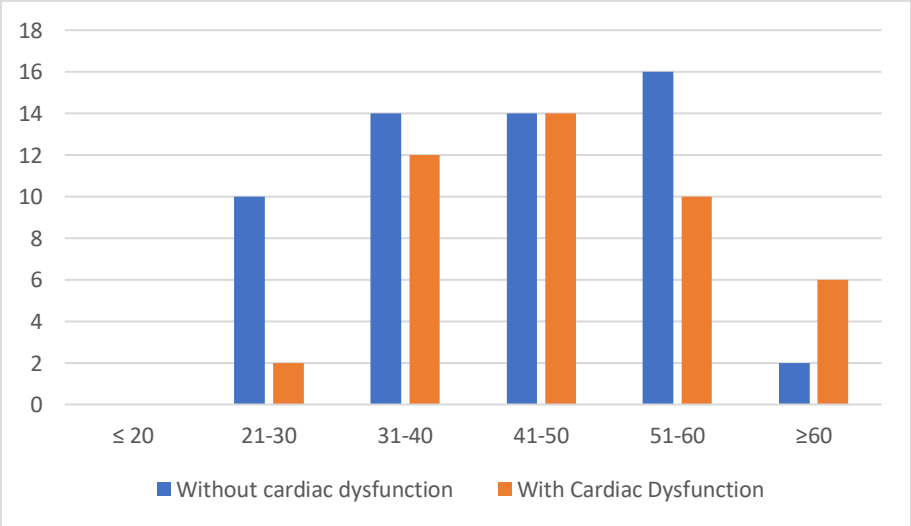

Table 2: Etiology of chronic liver disease

Etiology	With Cardiac Dysfunction (%)	Without Cardiac Dysfunctions (%)	Total (%)	$\chi 2$	P Value
Alcohol	40 (30.67)	30 (40)	70(70.67)	0.0393	0.843
Hepatitis B	2 (2.66)	10 (6.67)	12 (9.33)	0.627	0.428
Hepatitis C	2 (1.33)	0	2 (1.33)		
Wilson's	2 (1.33)	6 (4)	8 (5.33)	0.539	0.462
Others	4(1.33)	4 (6.67)	8 (13.33)		
Total	50	50	100		

Table 3: Prevalence of QT prolongation in CLD patients

QT Prolongation	Frequency (n=100)
Present	40
Absent	60

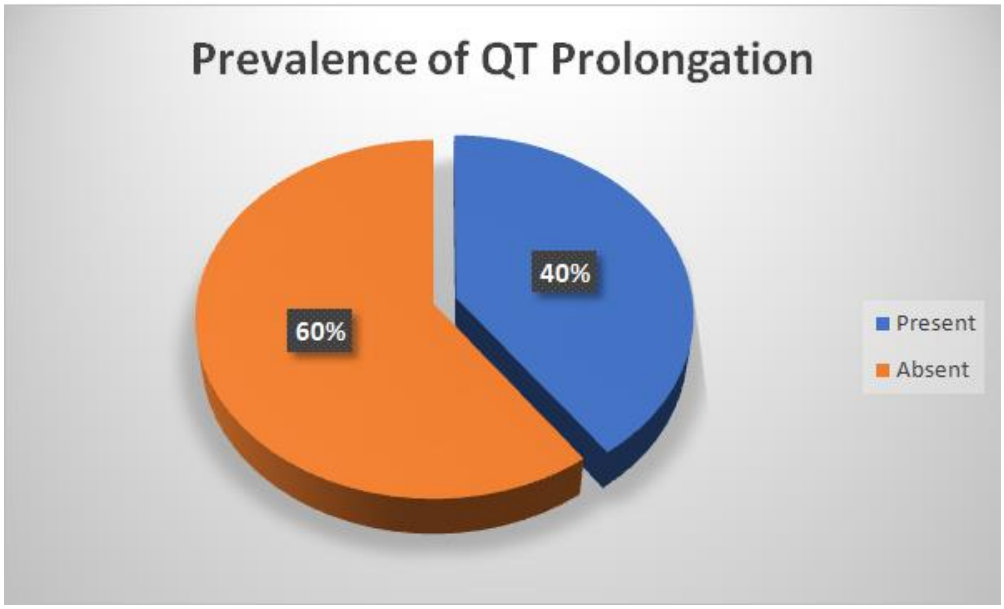

Table 4: Prevalence of Diastolic Dysfunction in CLD patients

Diastolic Dysfunction	Frequency (n=100)
Present	36
Absent	64

DISCUSSION

In patients with Chronic Liver Disease (CLD), the presence of subclinical cardiac dysfunctions is a significant contributor to morbidity and mortality, particularly when these patients undergo surgical procedures like Transjugular Intrahepatic Portosystemic Shunt (TIPS) or liver transplantation. The objective of our study was to determine the prevalence of cardiac dysfunctions in CLD patients.

In this study, we screened a total of 100 individuals who were diagnosed with CLD and had no known cardiac diseases. Notably, the majority of these patientswere male, which aligns with findings from other studies, including Abraham Sonny et al. Most of the patients fell within the age group of 41-50 years (28%), followed by 24% in the age groups of 21-30 years and 51-60 years each. The mean age of patients without cardiac dysfunction was 40.5 years, whereas the mean age of patients with cardiac dysfunction was slightly higher at 46.26 years[11]. The age group most commonly affected by cardiac dysfunctions in CLD patients was 51-60 years.The most prevalent etiological factor contributing to Chronic Liver Disease in our study, irrespective of the presence or absence of cardiac dysfunctions, was alcohol, affecting a significant 70.67% of the participants. Following closely, hepatitis B was the second most frequent cause, accounting for 9.33% of the cases.Among the 100 participants included in the study, a substantial 106 patients were diagnosed with alcohol-related liver disease, highlighting the substantial impact of alcohol consumption on liver health. Fourteen patients had liver disease directly attributed to hepatitis B infection.

In addition to these major causes, there were other, less common contributing factors. Notably, Wilson's disease was identified as a causative factor in eight cases, underscoring the significance of genetic factors

in liver diseases. Furthermore, hepatitis C played a role in two cases among the study participants.

It is also important to acknowledge that a group of 20 patients was categorized under "other causes." Within this category, two patients were diagnosed with autoimmune liver disease, emphasizing the autoimmune component in some cases of chronic liver disease[12]. Additionally, 18 individuals had cirrhosis with etiologies that remained unidentified. These patients either lacked access to specific diagnostic tests at our center, or their cirrhosis had no well-defined causative factors, highlighting the complexity of liver disease etiology. The study thus sheds light on the diverse range of factors contributing to chronic liver disease within this patient population.The results of our present study are in harmony with those from several other research endeavors conducted by Weigand et al, Shivram Prasad et al, and Kirnake et al. In each of these studies, alcohol stands out as the predominant and prevalent etiological factor contributing to the development of cirrhosis.

This consistent pattern across a spectrum of studies highlights the remarkable influence of alcohol consumption on the incidence and progression of cirrhosis. It underscores the pivotal role of alcohol-related liver disease in the broader context of liver pathologies. Such findings emphasize the critical need for public health interventions and education campaigns aimed at curbing excessive alcohol consumption, as it is a preventable yet leading cause of chronic liver disease. Acknowledging this consistent association across various studies bolsters our understanding of cirrhosis and reinforces the importance of addressing alcohol abuse as a major public health issue.

CONCLUSION

Among the 100 study participants, our investigation identified significant cardiac abnormalities, including QTc prolongation, diastolic dysfunctions, and systolic dysfunctions. In particular, QTc prolongation was observed in 42 out of the 100 study participants, while diastolic dysfunction was prevalent in 36 participants, accounting for 24% of the total study cohort. Moreover, systolic dysfunction was detected in 30 participants, representing 40% of the total study population.These findings are consistent with prior research studies conducted by Carey et al. (1995), Tiukinhoy-Liang et al. (2006), and Patel et al. (2011), which reported similar prevalence rates for these cardiac dysfunctions. Specifically, Carey and colleagues found a 27% prevalence, Tiukinhoy-Liang and team reported a 26% prevalence, and Patel et al. observed an 18% prevalence. This convergence of findings across multiple studies underscores the relevance and validity of our results, demonstrating the significance of cardiac dysfunctions in chronic liver disease patients and their consistency across various research investigations.

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