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FREQUENCY OF CIRRHOTIC CARDIOMYOPATHY IN PATIENTS WITH DECOMPENSATED CHRONIC LIVER DISEASE

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Abstract

Introduction: *Cirrhotic cardiomyopathy is a subclinical cardiac dysfunction observed in patients with liver cirrhosis, characterized by impaired systolic or diastolic function in the absence of known cardiac disease. It contributes to poor outcomes, especially in advanced liver disease or during stress events like liver transplantation. The aim of this study was to determine the frequency of cirrhotic cardiomyopathy in patients with cirrhosis presenting at a tertiary care hospital.*

Methodology: *This cross-sectional study was conducted at the Department of Medicine, Combined Military Hospital Kharian, over six months from September 2024 to March 2025. A total of 373 patients aged 18–75 years with ultrasound-proven cirrhosis and no prior cardiac illness were included after informed consent. All participants underwent 2D echocardiography to assess for systolic or diastolic dysfunction. Cirrhotic cardiomyopathy was diagnosed based on predefined echocardiographic criteria. Patients were stratified by age, gender, and Child-Pugh class. Data were analyzed using SPSS v20. Chi-square test was applied to assess associations, with a p-value ≤0.05 considered significant.*

Results: *Out of 373 patients, 195 (52.3%) were male and 178 (47.7%) were female. The mean age was 46.19 ± 16.73 years. Most patients fell into Child-Pugh Class B (50.2%), followed by Class A (32.4%) and Class C (17.4%). Cirrhotic cardiomyopathy was identified in 154 patients (41.3%).*

Conclusion: *Cirrhotic cardiomyopathy was present in over 40% of patients with liver cirrhosis. Although common, its presence did not show a statistically significant correlation with the severity of liver disease or demographic variables. Routine cardiac evaluation may be warranted in cirrhotic patients to detect subclinical dysfunction.*

INTRODUCTION

Cirrhotic cardiomyopathy is a recognized manifestation of cardiac impairment in individuals with liver cirrhosis, initially documented in the medical literature in 1953. This condition is characterized by impaired cardiac function in patients with cirrhosis, exhibiting reduced contractile responsiveness to stress, potential diastolic dysfunction, and electrophysiological irregularities, all in the absence of identifiable primary cardiac pathology.[1-2] The condition known as cirrhotic cardiomyopathy exhibits a worsening trajectory in tandem with the advancement of liver disease

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severity and is associated with adverse repercussions on the post-transplantation survival rates of individuals.[3]

Cirrhotic cardiomyopathy is a cardiac condition that may manifest as an extended QT interval on an electrocardiogram. This pathology can give rise to complications such as hepato-renal syndrome and congestive heart failure. While typically characterized by diastolic dysfunction at rest, the condition may become more apparent and reveal its associated complications under conditions of stress.[2] Individuals afflicted by cirrhotic cardiomyopathy exhibit a diminished life expectancy, elevated occurrences of hepatic encephalopathy, and heightened susceptibility to hepatorenal syndrome in contrast to counterparts lacking this condition.[4] A recent meta-analysis highlighted a high prevalence rate nearing 45%.[5] Furthermore, a recent study conducted in Pakistan specified that the prevalence of cirrhotic cardiomyopathy among the Pakistani population is recorded at 41.3%.[6]

A recent investigation carried out in Pakistan revealed a noteworthy correlation between the prolongation of the QTc interval and the severity of liver disease, manifesting in 58.64% of cirrhosis patients.[7] Pakistan, with a population exceeding 220 million individuals, stands as one of the nations with a notably high prevalence of hepatitis C and cirrhosis. Despite the prevalence of cirrhotic cardiomyopathy among cirrhosis patients, scant attention is typically given to its diagnosis and management in clinical practice. This underexplored area in our country has seen only a limited number of studies with small sample sizes conducted. Consequently, there exists a pressing need and responsibility to delve deeper into this issue.

METHODOLOGY

This cross-sectional study was conducted in the Department of Medicine at Combined Military Hospital (CMH), Kharian from September 2024 to March 2025 following the approval of the synopsis. A sample size of 373 patients was calculated using the WHO Sample Size Calculator, based on an expected frequency of cirrhotic cardiomyopathy of 43.1%, a 95% confidence interval, and a 5% margin of error.[6]

Patients aged between 18 and 75 years of both genders, presenting to the emergency department of CMH Kharian with cirrhosis confirmed on abdominal ultrasound, were included in the study after obtaining informed consent. Cirrhosis was diagnosed based on the presence of moderate to severe coarse echotexture of the liver. Patients with a known history of myocardial infarction, valvular heart disease, or rheumatic heart disease were excluded, as were those who refused to consent.

Each participant underwent a detailed evaluation, including abdominal ultrasound to confirm cirrhosis and 2D echocardiography to assess for cirrhotic cardiomyopathy. Cirrhotic cardiomyopathy was defined as the presence of either systolic or diastolic dysfunction on echocardiography, in the absence of prior cardiac illness. Systolic dysfunction was defined as a left ventricular ejection fraction of less than 50%, while diastolic dysfunction was defined by any three of the following echocardiographic criteria: septal e velocity < 7 cm/second, E/e ratio > 15, left atrial volume index (LAVI) > 34 mL/m², or tricuspid regurgitation (TR) velocity > 2.8 m/second.

Laboratory investigations including serum bilirubin, serum albumin, and international normalized ratio (INR) were performed to stratify patients according to the Child-Pugh score. Patients were also stratified by age and gender. All data were recorded in a structured proforma.

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Numerical variables such as age were expressed as mean ± standard deviation. Categorical variables including gender were presented as frequencies and percentages. The frequency of cirrhotic cardiomyopathy was determined, and associations with the child-pugh class, age, and gender were analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Of the total, 195 (52.3%) were male and 178 (47.7%) were female. The mean age of participants was 46.19 ± 16.73 years, with most patients aged 51–75 years (42.3%), followed by 31–50 years (35.7%) and 18–30 years (22.0%). Based on the Child-Pugh classification, 187 (50.2%) patients were in Class B, 121 (32.4%) in Class A, and 65 (17.4%) in Class C.

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The mean duration of cirrhosis was 10.16 ± 2.58 months; 201 (53.9%) patients had the disease for ≤10 months, while 172 (46.1%) had it for more than 10 months. Regarding body mass index (BMI), 185 (49.6%) patients were of normal weight and 188 (50.4%) were overweight, with a mean BMI of 25.02 ± 1.52 kg/m^2. Among comorbid conditions, 85 (22.8%) patients were smokers, 111 (29.8%) had diabetes mellitus, and 100 (26.8%) had hypertension. Cirrhotic cardiomyopathy was diagnosed in 154 (41.3%) patients, while 219 (58.7%) showed no evidence of cardiac involvement.

Cirrhotic cardiomyopathy was observed in 41.5% of males and 41.0% of females, showing no significant association with gender (p=0.918). Similarly, no statistically significant relationship was found between age groups and cirrhotic cardiomyopathy (p=0.768), though prevalence slightly increased with advancing age. In relation to liver disease severity, cirrhotic cardiomyopathy was most frequent in Child-Pugh Class C (46.2%) and least in Class A (33.9%), but the association was not statistically significant (p=0.128). Patients with cirrhosis duration >10 months showed a higher frequency of cardiomyopathy (44.8%) compared to those with ≤10 months (38.3%), again without statistical significance (p=0.207). No significant differences were noted in cirrhotic cardiomyopathy prevalence across BMI groups (p=0.772) or smoking status (p=0.784). Although diabetic patients (46.8%) and hypertensive patients (50.0%) exhibited a higher proportion of cirrhotic cardiomyopathy compared to non-diabetics (38.9%) and non-hypertensives (38.1%), these associations did not reach statistical significance (p=0.156 and p=0.059, respectively).

Table-1: Frequency distribution of different variables (n=373)

Variables		Frequency	Percent
Gender	Male	195	52.3
	Female	178	47.7
Age groups	18-30 years	82	22.0
	31-50 years	133	35.7
	51-75 years	158	42.3
	Mean age (years)	46.19±16.73	
Child-Pugh Class	Class-A	121	32.4
	Class-B	187	50.2
	Class-C	65	17.4
Duration of cirrhosis	≤10 months	201	53.9
	>10 months	172	46.1
	Mean duration (months)	10.16±2.58	
BMI	Normal	185	49.6
	Overweight	188	50.4
	Mean BMI (kg/m^2)	25.02±1.52	
Smoking	Yes	85	22.8
	No	288	77.2
Diabetes mellitus	Yes	111	29.8

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	No	262	70.2
Hypertension	Yes	100	26.8
	No	273	73.2
Cirrhotic cardiomyopathy	Yes	154	41.3
	No	219	58.7

Table-2: Stratification of cirrhotic cardiomyopathy with respect to different variables

Variables		Cirrhotic cardiomyopathy		p-value
		Yes	No	
Gender	Male	81(41.5%)	114(58.5%)	0.918
	Female	73(41.0%)	105(59.0%)	
Age groups	18-30 years	31(37.8%)	51(62.2%)	0.768
	31-50 years	56(42.1%)	77(57.9%)	
	51-75 years	67(42.4%)	91(57.6%)	
Child-Pugh Class	Class-A	41(33.9%)	80(66.1%)	0.128
	Class-B	83(44.4%)	104(55.6%)	
	Class-C	30(46.2%)	35(53.8%)	
Duration of cirrhosis	≤10 months	77(38.3%)	124(61.7%)	0.207
	>10 months	77(44.8%)	95(55.2%)	
BMI	Normal	75(40.5%)	110(59.5%)	0.772
	Overweight	79(42.0%)	109(58.0%)	
Smoking	Yes	34(40.0%)	51(60.0%)	0.784
	No	120(41.7%)	168(58.3%)	
Diabetes mellitus	Yes	52(46.8%)	59(53.2%)	0.156
	No	102(38.9%)	160(61.1%)	
Hypertension	Yes	50(50.0%)	50(50.0%)	0.059
	No	104(38.1%)	169(61.9%)	

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DISCUSSION

The present study demonstrates that cirrhotic cardiomyopathy (CCM) is a common complication in patients with decompensated chronic liver disease, with a frequency of 41.3%. This finding is consistent with several recent studies conducted in similar settings. Karagiannakis et al. reported a prevalence of 43% in cirrhotic patients using similar diagnostic criteria, while a study by Hammami et al. documented CCM in 38.7% of cirrhotic patients.[8-9] The relatively high prevalence highlights the clinical significance of cardiac dysfunction in cirrhosis and underscores the importance of cardiac assessment in these patients.

Our prevalence rate falls within the range reported in the literature, although considerable variability exists. A study from Egypt by El-Adawy et al. reported a higher prevalence of 59.6%, while Chen et al. found CCM in only 25.8% of cirrhotic patients in a Chinese population.[10-11] This variability may reflect differences in study populations, disease etiology, and importantly, the diagnostic criteria employed. The more recent and stringent 2019 Cirrhotic Cardiomyopathy Consortium criteria tend to yield lower prevalence rates compared to the original 2005 World Congress of Gastroenterology criteria.[12]

Regarding disease severity, our study found that CCM was more common in Child-Pugh Class C patients (46.2%) compared to Child-Pugh Class A (33.9%), but this difference did not reach statistical significance ($p=0.128$). This trend aligns with the observations of Nazar et al., who reported a gradual increase in cardiac dysfunction with worsening hepatic function.[13] In contrast, Samant et al. demonstrated a statistically significant relationship between CCM prevalence and Child-Pugh class ($p<0.01$), with CCM identified in 62.5% of Child-Pugh C patients compared to 25% in Child-Pugh A. The lack of statistical significance in our study may be attributed to our sample size distribution across Child-Pugh classes or differences in patient characteristics.[14]

Several pathophysiological mechanisms may explain the relationship between liver disease severity and cardiac dysfunction. As liver disease progresses, there is increased peripheral vasodilation, leading to arterial underfilling and subsequent neurohormonal activation. This state of chronic volume overload places strain on the myocardium, potentially leading to myocardial remodeling and fibrosis.[15] Additionally, inflammatory cytokines, which are elevated in advanced cirrhosis, have direct negative inotropic effects on cardiomyocytes. The presence of porto-systemic shunting may further contribute to cardiac toxicity by allowing gut-derived bacterial endotoxins to directly affect myocardial function.[16-17]

Our study found no significant association between CCM and gender ($p=0.918$) or age ($p=0.768$). This is consistent with findings from Ruíz-del-Árbol et al., who also reported no gender predilection for CCM.[18] However, some studies have suggested age-related differences. Bal et al. found that CCM was more prevalent in patients older than 50 years ($p<0.05$), suggesting that age-related changes in myocardial compliance may compound the cardiac effects of cirrhosis.[19] The discrepancy between these findings and our results may reflect differences in study populations or the confounding effect of other variables such as disease duration or etiology.

The clinical implications of CCM are significant, particularly in the context of invasive procedures and liver transplantation. Izzy et al. demonstrated that patients with CCM had higher rates of adverse cardiovascular events post-liver transplantation, with a hazard ratio of 1.8 (95% CI 1.1-2.9, $p=0.02$).[20] Similarly, Karagiannakis et al. reported that CCM was an independent predictor of mortality in cirrhotic patients, with a 2.2-fold increased risk compared to cirrhotic patients without cardiomyopathy.[8]

The diagnostic approach to CCM continues to evolve. Traditional echocardiographic parameters may lack sensitivity in detecting early cardiac dysfunction in cirrhotic patients. Newer modalities such as speckle-tracking echocardiography, which measures global longitudinal strain, have shown promise in identifying subclinical myocardial dysfunction in cirrhotic patients before conventional parameters become abnormal.[21-22] A recent study by Wiese et al. demonstrated that impaired global longitudinal strain was present in 78% of cirrhotic patients, many of whom had normal ejection fractions.[23]

Treatment options for CCM remain limited, with no specific therapies currently recommended.

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Management primarily involves addressing the underlying liver disease and controlling complications. Beta-blockers, commonly used to reduce portal pressure in cirrhotic patients, may theoretically exacerbate cardiac dysfunction by reducing contractility.[24-25] However, a recent meta-analysis by Sharma et al. suggested that non-selective beta-blockers might have a cardioprotective effect in cirrhotic patients, potentially by reducing the hyperdynamic state that contributes to cardiac remodeling.[26]

Our study has several limitations. The cross-sectional design precludes the assessment of temporal relationships and long-term outcomes. Additionally, we did not evaluate for CCM using advanced echocardiographic techniques such as strain imaging, which might have identified additional cases with subclinical dysfunction. The single-center nature of our study may limit generalizability, and the lack of a control group of non-cirrhotic patients prevents direct comparison of cardiac parameters with the general population.

Future research should focus on the prognostic implications of CCM in different clinical scenarios, such as TIPS placement and liver transplantation. Prospective studies evaluating the evolution of cardiac dysfunction with progression of liver disease would provide valuable insights into the natural history of CCM. Additionally, investigation into potential therapeutic interventions specifically targeting myocardial dysfunction in cirrhosis is warranted.

CONCLUSION

In conclusion, our study demonstrates that CCM is a common finding in patients with decompensated chronic liver disease, affecting more than 40% of patients. Although we observed a trend toward increasing prevalence with worsening liver function, this relationship was not statistically significant. No significant associations were found with age or gender. Given the high prevalence and potential clinical implications, routine cardiac evaluation should be considered in cirrhotic patients, especially prior to invasive procedures or liver transplantation.

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