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A Comprehensive Analysis of Cirrhotic Cardiomyopathy Among Patients with Liver Cirrhosis at Tertiary Care Hospital, Karachi

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Author`s Contribution

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ABSTRACT

Objective: To determine the prevalence and complications of cirrhotic cardiomyopathy (CCM) in liver cirrhosis patients at a tertiary care hospital in Karachi, and to analyze associated factors contributing to disease progression.

Methodology: This descriptive study was conducted at the Department of Medicine, Civil Hospital Karachi, from October 2020 to April 2021. A total of 95 patients diagnosed with liver cirrhosis were included. Data was collected using a structured format and analyzed using SPSS. Stratification was applied to assess the relationship between cirrhotic cardiomyopathy and key factors such as age, gender, and duration of cirrhosis. The study used echocardiography to evaluate cardiac function, and pro-BNP levels were measured to assess the severity of cardiomyopathy.

Results: The mean age of the patients was 43.66±4.87 years, with a mean heart rate of 73.51±12.41 beats/min, pro-BNP levels of 78.63±7.37 pg/ml, and mean cirrhosis duration of 1.65±0.99 years. Of the 95 patients, 15 (15.8%) had cirrhotic cardiomyopathy, while 80 (84.2%) did not. Gender distribution showed 48 (50.5%) males and 47 (49.5%) females. Cirrhotic cardiomyopathy was more common in patients with longer disease duration and higher Child-Pugh scores, but the differences were not statistically significant.

Conclusion: Cirrhotic cardiomyopathy is a prevalent but often underdiagnosed complication in liver cirrhosis patients, with significant implications for disease management. Early diagnosis and monitoring are crucial to preventing adverse cardiovascular outcomes in cirrhosis patients.

Keywords: Cirrhosis, liver complications, cardiomyopathy, Hepatitis C

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Introduction

Cirrhotic cardiomyopathy can be defined as the chronic dysfunction of the cardiac system, and well explained as diastolic and systolic abnormalities among patients with cardiac diseases.[1] The clinical diagnosis of cardiomyopathy is a complicated process. The prognosis of this disease is difficult to obtain hence assessing the rate of mortality and risk of developing more complications.

Cirrhosis is among the most common leading causes of mortality as a result of chronic hepatic diseases like hepatic encephalopathy, ascites, and variceal hemorrhages.[3] Cirrhotic cardiomyopathy is a chronic health condition commonly defined by the pathological condition of cardiac abnormalities, blunted contractile responsiveness towards stress, and abnormal systolic and diastolic relaxation with other electrophysiological abnormalities i.e., QT interval prolongation.[4] Disease like cirrhotic cardiomyopathy is associated with the progression of liver impairment, abnormal liver diseases, developing portal hypertension, and complications with advanced liver diseases.[5] The cirrhosis-associated complications can lead to more chronic such as cardiovascular dysfunction, portosystemic shunt insertions, pulmonary edema, and thus liver transplantation complications.[6,1] According to an estimation, patients with cirrhotic cardiomyopathy have a 50% chance of leading toward liver transplantation and

show the symptoms of cardiac dysfunction. Patients with a diagnosis of liver cirrhosis show normal ranges of systolic functions at resting position; however, the chronic condition could be tachycardia, high ejection fractions, increase in cardiac output and hyperdynamic circulation. Several studies showed variable frequency.[7]

A study found that out of 74 cirrhotic patients, 33 (44.6%) developed cirrhotic cardiomyopathy and found the frequency to be 51.1%.[19] Another study found 39.4% of cirrhotic patients had cirrhotic cardiomyopathy. Therefore, data from this study will not only help establish local perspective but also an effective management plan can be developed to prevent adverse outcomes.[7] Only a limited number of studies have been conducted on patients with cirrhotic cardiomyopathy, due to the silent nature of the disease and nearly normal cardiac output and hence the normal cardiac functions unless stress is involved.[8]

Cardiomyopathy among patients with liver cirrhosis was introduced over 3 decades ago and irrespective of cardio etiology, cirrhotic cardiomyopathy was explained as cardiac dysfunction in cirrhotic patients, in the absence of well-known cardio diseases the specific diagnostic criteria for CCM as suggested by international experts committee.[9] CCM is a chronic disease with multiple complications that remain unexplained when it comes to prevalence and associated complications.[10] The assessment of diseases like CCM in developing countries is needed at the different clinical setups to expand the knowledge of the disease and assess the rate of prevalence of diseases.

Methodology

This study was conducted at the Civil Hospital of Karachi in the medicine department for 06 months. The study's design was descriptive and started after approval was obtained for conducting the study from the College of Physicians and Surgeons Pakistan. A total of 95 samples were obtained, the sample size was calculated using the WHO's Rao soft[11] sample calculator by estimating the rate of prevalence of disease at 44.6% and 15 as margin of error =10% the confidence interval was 95%. The patients with confirmed diagnoses of liver cirrhosis between the age group of 20-60 years and ready for consent participated however, the patients with mental disabilities, pregnancies, and complicated diseases were excluded from the study. Patients with accepted informed consent based on inclusion criteria from the Civil Hospital Karachi medicine department. The systolic dysfunctions were compared by obtaining the ejection fraction rates of patients. The patient history was obtained in a structured format and by consulting with the cardiologist the echocardiography examination included two dimensions of echo and color was done and kept blind in the study.

Results

This study included the 95 patients presented at the Department of Medicine, Civil Hospital, of Karachi. The patients presented in the table showed male 50.53% however the females were 49.47%. The mean age, and duration of disease with liver cirrhosis presented in two categories showed the more numerous patients in the group with more than 2 years of disease. (Table I) Our study was 43.66±4.87 years, 73.51±12.41 beats/min, 78.63±7.37 pg/ml, and 1.65±0.99 years respectively.

Table I: Demographic details of patients.

Detail of participants (Demographic)		Participants (n=95)	
		n	%
Gender	Males	48	50.53%
	Females	47	49.47%
Age in years	20-40 years	16	16.84%
	41-60 years	79	83.16%
Duration of Cirrhosis	<2 years	33	34.74%
	>2 years	62	55.26%

Out of a total of 95 patients, 15 (15.8%) and 80 (84.2%) had and did not have cirrhotic cardiomyopathy. Out of 95 patients, 48 (50.5%) and 47 (49.5%) were male and female. The frequency of data showed the distribution of age showed that out of 95 patients, 16 (16.8%) and 79 (83.2%) patients were in the age groups 20-40 years and 41-60 years respectively. Frequency distribution of duration of cirrhosis showed that out of 95 patients, 33 (34.7%) and 62 (65.3%) had duration of liver cirrhosis of less than 2 years and more than 2 years.

Table II: Standard deviation of duration of disease.

Variable	Mean± SD	Min-Max
Age of participants	43.66±4.87	30-60
Duration of Cirrhosis (Years)	1.65±0.99	01-4
Heart Rate	73.51±12.41	67-110
PRO BNP (PG/ML)	78.63±7.37	55-120

The Child-Pugh scores showed that out of 95 patients, 63 (66.3%), 16 (16.8%), and 16 (16.8%) had Child Pugh scores A, B, and C respectively. Stratification for age for cirrhotic cardiomyopathy showed that 06 (40%) and 09 (60%) patients who were in the age group 20-40 years and 41-60 years had cirrhotic cardiomyopathy respectively. Whereas 10 (12.5%) and 70 (87.5%) patients who were in the age group 20-40 years and 41- 60 years did not have cirrhotic cardiomyopathy respectively. The value of P was 0.01. Stratification for gender concerning cirrhotic

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Table III: Cirrhotic cardiomyopathy concerning variables.

Demographic variables		CIRRHOTIC CARDIOMYOPATHY		TOTAL N (%)	P-Values
		YES	NO		
Age	20-40	06 (40%)	10 (12.5%)	16 (16.8%)	0.01
	40-60	09 (60%)	70 (87.5%)	79 (83.2%)	
Gender	Male	08 (53.3%)	40 (50%)	48(50.5%)	0.51
	Female	07 (46.7%)	40 (50%)	47 (49.5%)	
Duration of disease	< 2 YEARS	05 (33.3%)	28 (35%)	33 (34.7%)	0.57
	> 2 YEARS	10 (66.7%)	52 (65%)	62 (65.3%)	
Child PUGH Score	A	08 (53.3%)	55 (68.8%)	63 (66.3%)	0.45
	B	03 (20%)	13 (16.2%)	16 (16.8%)	
	C	04 (26.7%)	12 (15%)	16 (16.8%)	

cardiomyopathy showed that 08 (53.3%) and 40 (50%) who were in the male group had and did not have cirrhotic cardiomyopathy respectively. Whereas 07 (46.7%) and 40 (50%) who were in the female group had and did not have cirrhotic cardiomyopathy respectively. P-value was 0.51. (Table III)

Stratification for the duration of cirrhosis for cirrhotic cardiomyopathy showed that patients who had cirrhosis for < 2 years, 05 (33.3%) and 28 (35%) had and did not have cirrhotic cardiomyopathy respectively. Whereas patients who had cirrhosis for > 2 years, 10 (66.7%) and 52 (65%) had and did 75 not have cirrhotic cardiomyopathy respectively. P-value was 0.57.

Stratification for a child's Pugh score concerning cirrhotic cardiomyopathy showed that 08 (53.3%), 03 (20%), and 04 (26.7%) who were in child Pugh score groups A, B, and C had cirrhotic cardiomyopathy respectively. Whereas 55 (68.8%), 13 (16.2%), and 12 (15%) who were in child-Pugh score groups A, B, and C did not have cirrhotic cardiomyopathy respectively. The value of P was 0.45. Stratification for diabetes mellitus type II concerning cirrhotic cardiomyopathy showed that in patients who had diabetes mellitus, 05 (33.3%) and 17 (21.2%) had and did not have cirrhotic cardiomyopathy respectively. Of patients who did not have diabetes mellitus, 10 (66.7%) and 63 (78.8%) had and did not have cirrhotic cardiomyopathy respectively. P-value was 0.24. Stratification for hypertension concerning cirrhotic cardiomyopathy showed that in patients who had hypertension, 05 (33.3%) and 31 (38.8%) had and did not have cirrhotic 76 cardiomyopathy respectively.

Discussion

Our study included 95 patients with Mean age, heart rate, proBNP and duration of cirrhosis in our study were 43.66±4.87 years, 73.51±12.41 beats/min,78.63±7.37 pg/ml, and 1.65±0.99 years. 48 (50.5%) and 47 (49.5%) were male and female. of 95 patients, 15 (15.8%) and 80 (84.2%) had and did not have cirrhotic cardiomyopathy. A recent study conducted on patients with liver cirrhosis showed that 25.5% of patients with systolic dysfunction and cardiomyopathy.[12] The study also used the same inclusion criteria and adopted a similar mode of study confirming the findings with echocardiography as our study[13]. The child Pugh scores were one of the main highlights of our study which demonstrated the severity of diseases along with the rise in liver diseases. The mean age and duration of diseases with cardiomyopathy was 43.66 years, which is one of the comparable factors with other studies conducted on similar patients. Our study showed the findings with hypertension heart rates of 73.51±12.41 beats/min,78.63±7.37 pg/ml, and 1.65±0.99 years respectively.[14]

Diastolic dysfunction is considered to be present among the majority of patients with cirrhotic cardiomyopathy however the silent feature of this disease makes it difficult to address. In our study, the diastolic dysfunction of cardiac patients was based on the E/A ratios which were frequently found in cirrhotic patients and the findings remained statistically significant when the findings were compared with the cirrhotic cardiomyopathy.[15] The stratification of data has been seen in the studies showing the comparative analysis of different variables, our study showed the stratification of cirrhotic cardiomyopathy among ages groups 20-40years and 41-60 years of age having the disease cardiomyopathy, the finding showed 10 (12.5%) and 70 (87.5%) patients who were in the age group 20-40 years and 41- 60 years did not have cirrhotic cardiomyopathy respectively.[16-17] The value of P was 0.01.

Stratification for gender concerning cirrhotic cardiomyopathy showed that 08 (53.3%) and 40 (50%) who were in the male group had and did not have cirrhotic cardiomyopathy respectively. Whereas 07 (46.7%) and 40 (50%) who were in the female group had and did not have cirrhotic cardiomyopathy respectively. P-value was 0.51 compared to the study conducted previously with more significant findings. The Stratification for the duration of

cirrhosis for cirrhotic cardiomyopathy showed that patients who had cirrhosis for < 2 years, 05 (33.3%) and 28 (35%) had and did not have cirrhotic cardiomyopathy respectively.[18] Whereas patients who had cirrhosis for > 2 years, 10 (66.7%) and 52 (65%) had and did 75 not have cirrhotic cardiomyopathy respectively. The P-value was 0.57 showing the contract comparison to the study conducted earlier.[19]

The Stratification for a child's Pugh score concerning cirrhotic cardiomyopathy showed that 08 (53.3%), 03 (20%), and 04 (26.7%) who were in child Pugh score groups A, B, and C had cirrhotic cardiomyopathy respectively. Whereas 55 (68.8%), 13 (16.2%), and 12 (15%) who were in child-Pugh score groups A, B, and C did not have cirrhotic cardiomyopathy respectively. The value of P was 0.45. Stratification for hypertension concerning cirrhotic cardiomyopathy showed that in patients who had hypertension, 05 (33.3%) and 31 (38.8%) had and did not have cirrhotic 76 cardiomyopathy respectively. A similar study[20] was A comparable report directed at patients with cirrhosis, 35 (39.32%) had cirrhotic cardiomyopathy. All parts of cirrhotic cardiomyopathy, as systolic brokenness, diastolic brokenness, delayed QT span, and heart biomarkers, were measurably huge (p = 0.001) contrasted and patients without cardiomyopathy. Cirrhotic cardiomyopathy boundaries emphatically corresponded with propelling liver sickness.[21]

Stratification for cirrhotic cardiomyopathy and other complications have been tended to in a review showing the discoveries of diabetes mellitus, 05 (33.3%) and 17 (21.2%) had and didn't have cirrhotic cardiomyopathy separately. Of patients who didn't have diabetes mellitus, 10 (66.7%) and 63 (78.8%) had cirrhotic cardiomyopathy separately.[22] The P-value shown was 0.24. 122 patients with cirrhosis satisfied the inclusion criteria The cirrhotic cardiomyopathy was comparative for 2005 Montreal and 2019 CCC: 67.2% versus 55.7% (P = .09); and altogether higher contrasted with 2009 ASE/EACVI models: 67.2% versus 35.2% (P < .0001) and 55.7% versus 35.2% (P = .002) individually. cirrhosis, 118 (51.1%) had cirrhotic cardiomyopathy. Those with cirrhotic cardiomyopathy were more seasoned (62.7 versus 57.8 years; p<0.001) and have female sex (55.8 versus 40.2%; p=0.02), contrasted with those without cirrhotic cardiomyopathy.[2] The probability of cirrhotic cardiomyopathy expanded with every quartile old enough with a 95% confidence interval. The absolute most normal reason for cirrhosis was ascribed to incomprehensible causes (39.4%), and viral hepatitis (15.5%). Patients with alcoholic cirrhosis are more bound to have cirrhotic cardiomyopathy than patients with obscure reasons for cirrhosis, (p= 0.00).[24]

Conclusion

Cirrhotic cardiomyopathy is a continuous yet exposed confusion in cirrhosis of the liver. All parts of cardiovascular brokenness, for example, systolic, diastolic, and electrocardiographic changes, are available in patients with cirrhotic cardiomyopathy. The components engaged with the weakened contractile capability of the cardiomyocyte in trial cirrhosis incorporate disability of the b-adrenergic receptor flagging, unusual cardiomyocyte film lipid arrangement and biophysical properties, particle channel deformities, and overactivity of humoral inhibitory variables. The level of cardiovascular brokenness connects with liver capability and the clinical outcomes are connected with the decay of circulatory capability and the hazard of HRS advancement during cirrhosis. The seriousness of cardiac dysfunction might be the main cause of high mortality rates.

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