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# Frequency of cirrhotic cardiomyopathy in decompensated liver cirrhosis patients.

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**ABSTRACT… Objective:** To determine the frequency of cirrhotic cardiomyopathy in decompensated liver cirrhosis patients. **Study Design:** Descriptive, Cross-sectional. **Setting:** Department of Medicine, Bahawal Victoria Hospital, Bahawalpur. **Period:** February 2022 to August 2022. **Material & Methods:** Patients of either gender having age between 25-65 years with decompensated liver cirrhosis (duration >6 months) were analyzed. Demographic and clinical characteristics of each patient were recorded at the time of the inclusion. Then, echocardiography was done in each patient by consultant cardiologist and presence or absence of cirrhotic cardiomyopathy was noted. **Results:** In a total of 92 patients, 54 (58.7%) were male and 38 (41.3%) were female with male to female ratio as 1.4:1. The mean age was 42.92±8.72 years while 57 (61.96%) patients were aged between 25 to 45 years. The mean duration of disease was 8.52±2.48 months. The mean body mass index was 27.46±2.97 kg/m2. Diabetes was noted in 28 (30.4%) patients while 35 (38.0%) had hypertension. Frequency of cirrhotic cardiomyopathy in patients with decompensated liver cirrhosis was found in 38 (41.3%). **Conclusion:** This study concluded that the frequency of cirrhotic cardiomyopathy in decompensated liver cirrhosis patients is quite high.

**Key words:** Body Mass Index, Cirrhotic Cardiomyopathy, Diabetes Mellitus, Echocardiography, Hypertension, Liver Cirrhosis.

## INTRODUCTION

Cirrhosis is caused by long-term liver damage resulting in impaired function of the liver. Injured tissues of the liver instigate parenchyma to undergo structural modification and distortion of normal hepatic architecture.[1] Sustained liver fibrosis and lump regeneration cause this modification in the structure. There are two phases of the progression of cirrhosis. First phase is termed as compensated phase which is characterized by asymptomatic representation of the patient. In second phase, disease progresses further to evolve decompensated cirrhosis, systemic manifestations are the characteristics of this phase, and the extent of this evolution depends up on the patient.[2] An imbalance in the systemic hemodynamics is the leading pathophysiological mechanism behind liver cirrhosis.[3]

For years, it was in the recognition that in liver cirrhosis patients, alcohol was directly responsible for cardiac dysfunction due to its toxic effects.[4] Later in 1953, Kowalski and Abelmann indicated that cardiovascular dysfunction existed in liver cirrhosis patients.[5] Since that time, such findings have consistently been reproduced by numerous studies.[2] Considering the fact that 25% cardiac output is directed to the liver, it is expected that liver disease can alter the function of cardiovascular system. As cirrhosis of the liver progresses further, it results in the occurrence of hyperdynamic circulatory state by which cardiac dysfunctions are induced to represent CCM syndrome.[6,7]

In a study, cirrhotic cardiomyopathy (CCM) was diagnosed in 39.32% cirrhotic patients.[8] A local study has shown CCM in 44.6% of the cases.[9] Another study reported the incidence of CCM as 49.0%.[10] As the previous studies have shown variation in frequency of CCM in patients with chronic liver disease, therefore we planned for

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a study to determine the frequency of CCM in patients with chronic liver disease. The study results were thought to furnish the existing data to have further benefits. Our study can give empirical evidence regarding statistics about the burden of CCM in local population. The objective of this study was to determine the frequency of CCM in decompensated liver cirrhosis patients presenting to medical and cardiology units of Bahawal Victoria Hospital, Bahawalpur.

## MATERIAL & METHODS

This descriptive, cross-sectional study was carried out at "The Department of Medicine, Bahawal Victoria Hospital, Bahawalpur", Pakistan from February 2022 to August 2022. A sample size of 92 cases was calculated by considering expected frequency of CCM in decompensated liver cirrhosis as 39.32%8 at 95% confidence level with 10% margin of error.

Inclusion criteria were the patients of either gender having age between 25-65 years with decompensated liver cirrhosis (duration >6 months). Exclusion criteria were the cases with prior history of myocardial infarction (assessed on history and medical record). Patients with history of valvular heart disease, cardiac failure (assessed on history and medical record), and the patients who had been taking medications like calcium channel blockers, antiarrhythmics and digoxin, were also excluded. The diagnosis of decompensated liver cirrhosis was made on the basis of ultrasonographic findings including the patients who had portal vein diameter >13 mm, size of spleen (length) >13 cm, liver in normal size (13-16 cm) with coarse echo-texture or shrunken (<13 cm), and positive shifting dullness were taken as positive. Already diagnosed hypertensive (blood pressure >140/90 mmHg on multiple occasions) patients for last 2 or more years and taking medication were considered as hypertensive. Diabetes mellitus was designated to those patients who were already diagnosed as diabetic patients for the last 2 or more years and were taking medications. Informed and written consents were obtained from patients. Approval from "Institutional Ethical Committee" was acquired (263/IERB/QAMC Bahawalpur).

Demographic and clinical characteristics of each patient were recorded at the time of their inclusion. Then, echocardiography was done in each patient by consultant cardiologist and presence or absence of CCM was noted. CCM was labeled as "resting ejection fraction <55%, ratio of early to late phases of ventricular filling <1.0, prolonged declaration time (>200 msec), prolonged isovolumic relaxation time (>80 msec)".[11]

The data was analyzed using "Statistical Package for Social Sciences (SPSS)", version 26.0. Mean and standard deviation were calculated to represent the quantitative variables (age, height, weight, BMI and duration of disease). Qualitative variables including gender, smoking (yes/no), diabetes mellitus (yes/no), hypertension (yes/no) and CCM (present/absent) were shown as frequency and percentages. Effect modifiers such as patient's age, gender, duration of disease, BMI, diabetes mellitus (yes/no), hypertension (yes/no) and smoking (yes/no) were controlled by making stratified tables. Their effects on frequency of CCM were observed by applying post-stratification chi-square test and p value <0.05 was considered as significant.

## RESULTS

In a total of 92 patients, 54 (58.7%) were male and 38 (41.3%) were female with male to female ratio as 1.4:1. The mean age was 42.92±8.72 years while 57 (61.96%) patients were aged between 25 to 45 years. The mean duration of disease was 8.52 ± 2.48 months. The mean BMI was 27.46±2.97 kg/m2. Diabetes was noted in 28 (30.4%) patients while 35 (38.0%) had hypertension (Table-I).

Frequency of CCM among cases of decompensated liver cirrhosis was found in 38 (41.3%). Details about the stratification of CCM with respect to study variables are shown in Table-II.

| Characteristics | | Frequency (%) |
|---|---|---|
| Age (years) | 25-45 | 57 (62.0%) |
| | 46-65 | 35 (38.0%) |
| Gender | Male | 54 (58.7%) |
| | Female | 38 (41.3%) |
| Disease duration (months) | >6-9 | 66 (71.7%) |
| | >9 | (28.3%) |
| BMI (kg/m2) | <30 | 73 (79.3%) |
| | ≥30 | 19 (20.7%) |
| Smoking | | 19 (20.7%) |
| Diabetes mellitus | | 28 (30.4%) |
| Hypertension | | 35 (38.0%) |

**Table-I. Demographic and clinical characteristics (n=92)**

## DISCUSSION

Among patients with decompensated liver cirrhosis, CCM was observed in 41.3% of the cases in this study. CCM in contemporary literature has shown that the frequency ranges between 3 and 23% among liver cirrhosis patients, which seems lesser than our findings.[12] Study done by Cesari et al reported the prevalence of CCM as 29%.[13] The scarcity of data on the actual prevalence of cirrhotic cardiomyopathy (CCM) is attributed to the disease's usual asymptomatic nature, displaying nearly normal cardiac function until patients encounter stress.[14]

| Characteristics | | Cirrhotic Cardiomyopathy | | P-Value |
|---|---|---|---|---|
| | | Present (n=38) | Absent (n=54) | |
| Age (years) | 25-45 | 23 (60.5%) | 34 (63.0%) | 0.813 |
| | 46-65 | 15 (39.5%) | 20 (37.0%) | |
| Gender | Male | 21 (55.3%) | 33 (61.1%) | 0.575 |
| | Female | 17 (44.7%) | 21 (38.9%) | |
| Disease duration months) | >6-9 months | 26 (68.4%) | 40 (74.1%) | 0.553 |
| | >9 months | 12 (31.6%) | 14 (25.9%) | |
| BMI (kg/m2) | ≤30 | 27 (71.1%) | 46 (85.2%) | 0.099 |
| | >30 | 11 (28.9%) | 8 (14.8%) | |
| Smoking | | 6 (15.8%) | 13 (24.1%) | 0.334 |
| Diabetes Mellitus | | 12 (31.6%) | 16 (29.6%) | 0.841 |
| Hypertension | | 16 (42.1%) | 19 (35.2%) | 0.501 |

**Table-II. Stratification of cirrhotic cardiomyopathy with respect to study variables (N=92)**

According to researchers, as many as 50% of patients undergoing liver transplantation develop certain indications of cardiac dysfunction, with approximately 7-21% of them succumbing to heart failure in the post-liver transplantation period.[15] Baik et al. proposed that a considerable proportion of cirrhotic patients classified as Child-Pugh class B and C exhibit at least one aspect of CCM, such as QTc prolongation and diastolic dysfunction.[16] They further suggested that diagnostic tests for diastolic dysfunction, such as echocardiograms or dynamic cardiac MRI, could be valuable screening tools for detecting CCM, given that nearly all patients with moderately advanced cirrhosis display some level of diastolic dysfunction.[16]

For years, it has been part of the knowledge that liver function is closely related to the cardiac function.[17] Alcoholic cirrhosis may cause alcoholic cardiomyopathy in patients, and those patients who have non-alcoholic steatohepatitis are more likely to develop cardiovascular complications.[18] Cardiac dysfunction of a certain type presented by cirrhotic patients has been designated as CCM, irrespective of the liver disease causes.[19] In cirrhosis, various types of cardiovascular abnormalities combine to develop CCM. On the account of liver dysfunction and portosystemic shunting, several potent vasoactive substances are activated and from liver, cardio-suppressive factors come into the circulation to cause an arterial vasodilatation.[20] Stress electrocardiogram, pharmacological stress or Doppler echocardiography including speckle tracking with measurement of strain, are the possible options to detect CCM.[21] MRI is one of the latest techniques which also determines the flow and extracellular volume.[22,23]

Being a single center study conducted on a relatively small sample size were some of the

limitations of this research. We were unable to record outcomes in this study.

## CONCLUSION

The frequency of CCM in decompensated liver cirrhosis patients is quite high. In patients of chronic liver disease, early identification of CCM may help better management aiming reduction in morbidity and mortality.



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| 3 | Saleem Danish | Drafting. |  |
| 4 | Syed Zain Ul Abidin | Data collection, Data analysis. |  |
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