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Original Research Article

EVALUATION OF CARDIOVASCULAR DYSFUNCTION IN CHRONIC HEPATIC DISEASE

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ABSTRACT Background: Cardiovascular (CV) dysfunction refers to any abnormality or impairment in the function of the cardiovascular system, which includes the heart, blood vessels, and blood **Objective:** The present study was conducted to assess cardiovascular dysfunction in chronic hepatic disease. **Materials & Methods:** 100 patients of chronic hepatic disease of both genders were subjected to liver function tests (LFT), prothrombin time/international normalized ratio (INR), abdominal ultrasound, upper gastrointestinal endoscopy, cytology and serum ascites albumin gradient, HBsAg, anti-HCV, serum ceruloplasmin, and antinuclear antibody. The Child-Pugh score was calculated to classify the severity of chronic hepatic disease (CHD). Parameters such as stroke volume index (SVI), cardiac index (CI), ejection fraction (EF), diastolic dysfunction (DD), left ventricular mass index (LVMI), etc., were recorded. **Results:** Out of 100 patients, males were 58 and females were 42. Chronic hepatic disease was mild in 18% of cases, moderate in 36%, and severe in 46%. The difference was significant (P< 0.05).Stroke volume index (SVI) was increased in 56% and decreased in 44% (p=0.059), and cardiac index (CI) was increased in 61% and decreased in 39% (p=0.001). Ejection fraction (EF) went up in 58% of cases and went down in 42%, diastolic dysfunction (DD) was found in 39% of cases, and 19% of cases showed an increase in EF after paracentesis. The difference was significant (P< 0.05). **Conclusion:** To predict the chances of serious heart problems, it's important to have a good understanding of cirrhotic cardiomyopathy and cardiovascular dysfunction in patients with chronic hepatic disease.

INTRODUCTION

Cardiovascular (CV) dysfunction refers to any abnormality or impairment in the function of the cardiovascular system, which includes the heart, blood vessels, and blood.[1,2] The CV system plays a vital role in maintaining overall health by transporting oxygen, nutrients, hormones, and waste products throughout the body.[3-5] Cardiac disease itself can result in hepatic dysfunction.[6] For example, ongoing heart failure or long-term problems with the right side of the heart can lead to blocked blood flow in the liver and liver damage, while low blood flow and poor blood supply can cause issues in the liver and other body systems. However, liver dysfunction often has unintended consequences for the cardiovascular system. In advanced chronic hepatic disease (CHD), lower resistance in the veins throughout the body mainly happens because of the widening of small blood vessels in the digestive area, leading to increased blood flow.

Clinical signs of CV dysfunction often remain hidden, as they are not always apparent.[11] Cardiac output has increased, which is the most noticeable hemodynamic characteristic. Many cases show a higher left ventricular ejection fraction (LVEF).[12,13] Patients with chronic hepatic disease (CHD) who face different challenges such as exercise, infections, or surgeries like transjugular intrahepatic portosystemic shunt (TIPS) or liver transplantation are especially likely to experience heart problems and cirrhotic cardiomyopathy, which are significant but often overlooked causes of illness and death.

We conducted the present study to assess cardiovascular dysfunction in chronic hepatic disease.

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MATERIALS AND METHODS

The present study consisted of 100 patients of chronic hepatic disease of both genders at a Government Medical College (GMC). This study was approved by the Ethical Committee of Government Medical College, Mahboobnagar. Duration of study: March 2024 to February 2025.

All gave their written consent to participate in the study. Data such as name, age, gender, etc., was recorded. Everyone underwent tests including liver function tests (LFT), prothrombin time/international normalized ratio (INR), abdominal ultrasound, upper gastrointestinal endoscopy, cytology, serum ascites albumin gradient, HBsAg, anti-HCV, serum ceruloplasmin, and antinuclear antibody. The Child-Pugh score was calculated to classify the severity of CHD. Parameters such as stroke volume index (SVI), cardiac index (CI), ejection fraction (EF), diastolic dysfunction (DD), left ventricular mass index (LVMI), etc., were recorded.

The limitation the study is small sample size.

Statistical Analysis

Statistical analyses were done using SPSS for Windows software (version 22; SPSS Inc., Chicago, IL, USA). For parametric tests, descriptive statistical values were given as mean and standard deviation. For non-parametric tests, they were given as median, minimum, and maximum values. For categorical data, they were given as frequency and ratio. Student's t-test and paired t-test were used to compare variables. P value less than 0.05 was considered significant.

RESULTS

A total of 100 patients with chronic hepatic disease complications were included in this study. The male population was higher than the female population; the ratio of male to female was 1.38:1. The mean ± standard deviation of patients' age was 64.52 ± 8.73 years old, with the minimum and maximum ages of 20 and 82 years old, respectively. Chronic hepatic disease was mild in 18% of cases, moderate in 36%, and severe in 46%. The difference was significant (P< 0.05). Demographic characteristics of patients are shown in Table 1.

Table 1: Demographic characteristics of patients (N=100)

Demographic characteristics	Number of patients (%)	P value
Sex		
Male	58 (58)	0.016
Female	42 (42)	
Chronic hepatic disease		
Mild	18 (18)	0.01
Moderate	36 (36)	
Severe	46 (46)	

Table 2 shows that stroke volume index (SVI) was increased in 56% and decreased in 44% (p=0.059), and cardiac index (CI) was increased in 61% and decreased in 39% (p=0.001). Ejection fraction (EF) went up in 58% of cases and went down in 42%, diastolic dysfunction (DD) was found in 39% of cases, and 19% of cases showed an increase in EF after paracentesis. The difference was significant (P< 0.05).

Table 2: Assessment of parameters

Parameters	Variables	Number (%)	P value
Stroke volume index (SVI)	Increased	56 (56)	0.059
	Decreased	44(44)	
Cardiac index (CI)	Increased	61(61)	0.001
	Decreased	39(39)	
Ejection fraction (EF)	Increased	58(58)	0.016
	Decreased	42(42)	
Diastolic dysfunction (DD)	-	39(39)	-
Increased EF after paracentesis	-	19(19)	-

DISCUSSION

The management of CV dysfunction depends on the specific condition and may include lifestyle modifications, medications, surgical interventions (such as bypass surgery or valve replacement), or cardiac rehabilitation programs.[16,17] Early diagnosis, regular monitoring, and adherence to treatment plans are essential for minimizing complications and improving outcomes for individuals with CV dysfunction.[18] We conducted the present study to assess cardiovascular dysfunction in chronic hepatic disease.

We found that out of 100 patients, males were 58% and females were 42%; the male population was higher than the female population; the ratio of male to female was 1.38:1. Bandyopadhyay et al,[19] studied the presence, types, and severity of cardiovascular (CV) dysfunction in 50 patients with CHD, of whom 14.3% had mild, 34.3% moderate, and 51.4% severe CHD (by Child-Pugh Class); 28.6% had a high normal heart rate (90 to 100/min),

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45.7% had increased stroke volume index, and 42.9% had increased cardiac index, reflecting hyperdynamic circulation. In 42% of cases, the left ventricular ejection fraction increased by more than 65%, reflecting hyperdynamic circulation (<55% in 23% of cases), which may be an indicator of cirrhotic cardiomyopathy. Ejection fraction was significantly increased after paracentesis in 33.3% of patients, reflecting the mechanical effect of ascites on cardiac function. Diastolic dysfunction was present in 60% of cases, and the left ventricular mass index was increased in 45.7% of cases. All the parameters correlated with the increasing Child-Pugh Class severity of CHD. We found that CHD was mild in 18% of cases, moderate in 36%, and severe in 46%. The difference was significant (P< 0.05).

In their study, Chandey et al,[20] included 90 patients of both sexes with liver cirrhosis. The QTc interval increased linearly with the severity of liver cirrhosis. Mean values of QTc in Child-Pugh Class A=425.00±20.97, Class B=437.35±42.60, and Class C=479.71±29.48, with a p-value of 0.04, which is significant. Diastolic dysfunction was also related to the severity of liver cirrhosis. In Child-Pugh Class A, 2 (33%) patients had grade 1 diastolic dysfunction; in Class B, 23 (59%) patients had grade 1 diastolic dysfunction; and in Child-Pugh Class C, C=3 (7%) patients had grade 1 diastolic dysfunction, 33 (73%) patients had grade 2 diastolic dysfunction, and 1 (2%) patient had grade 3 diastolic dysfunction, with a p-value of 0.04, which is significant. Systolic function was found to be normal in all the patients.

We found that stroke volume index (SVI) was increased in 56% and decreased in 44% (p=0.059), and cardiac index (CI) was increased in 61% and decreased in 39% (p=0.001). Ejection fraction (EF) went up in 58% of cases and went down in 42%, diastolic dysfunction (DD) was found in 39% of cases, and 19% of cases showed an increase in EF after paracentesis.

Naik et al,[21] found that a history of alcohol consumption was found in 36 (72%) of the patients. The most common symptoms were ascites, jaundice, and malena. Mean total count was 7144±1568. Mean blood urea level was 38.4±19.78, while mean serum creatinine was 1.0±0.72. Mean albumin level was 2.9±0.81. Mean serum bilirubin total, direct, and indirect was 6.1±8.08, 4.35±5.98), and 1.8±2.19, respectively.

Diastolic dysfunction was present in about 66% (33 out of 50) of patients. The patients with cirrhosis develop cirrhotic cardiomyopathy, and this cirrhotic cardiomyopathy was not related to the etiology of liver cirrhosis. Kumar et al,[22] assessed the prevalence of cardiac dysfunction in patients with liver cirrhosis and analyzed its relation with the Model for End-Stage Liver Disease (MELD) score. 100 patients with liver cirrhosis were enrolled for the study and divided into 3 groups according to MELD score: ≤9, 10-19, and ≥20. All study participants underwent detailed cardiac assessment with Doppler echocardiography. The prevalence of cardiac dysfunction and its relation to the MELD score were determined. Prevalence of CCM and diastolic dysfunction (DD) was 48% and 30%, respectively. A total of 82%, 59%, and 50% of patients had prolonged corrected QT interval (QTc), isovolumic relaxation time (IVRT), and deceleration time (DT), respectively. The prevalence of CCM, DD, prolonged QTc, IVRT, and DT had a significant correlation with MELD scores (P < 0.05).

CONCLUSION

Authors discovered that to predict the chances of bad heart events, it's important to have a good understanding of cirrhotic cardiomyopathy and CV dysfunction in patients with chronic hepatic disease (CHD).

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