

# Echocardiographic Changes in Chronic Liver Disease

P. Punekar<sup>1</sup>, Dinesh Kumar Thakur<sup>2</sup>

## ABSTRACT

**Introduction:** Echocardiography is a non-invasive method to find cirrhotic cardiomyopathy in chronic liver disease. Almost one-fourth of deaths in chronic liver disease are due to cardiac abnormalities, So early detection of subclinical cardiac changes is important to reduce morbidity and mortality in chronic liver disease patients. Current research objective was to study the clinical profile with special reference to cardiovascular system in patients with chronic liver disease, to find out the incidence of cardiac changes in patient with chronic liver disease using echocardiography, to correlate the clinical profile and echocardiographic changes in patients with chronic liver disease and to find out the incidence of hepato / porto pulmonary arterial hypertension in patient with chronic liver disease.

**Material and methods:** The present study was carried out 100 indoor patients admitted in the Department of Medicine, N.S.C.B. Medical College Hospital, Jabalpur, and Madhya Pradesh. Diagnosis of chronic liver disease was made on the basis of clinical history and examination, biochemical and serological evaluation, and ultrasonographic imaging.

**Results:** Based on Child Turcotte Pugh score for severity of cirrhosis, 43% of cases were in Child class A, 45% in Class B and 12% in class C. The incidence of cardiac abnormalities increased with duration of chronic liver disease. Incidence of diastolic dysfunction was 32% (P = 0.00001), systolic dysfunction was 6% (P = 0.0033), pericardial effusion was 22% (P = 0.00001), pulmonary arterial hypertension was 6% (P = 0.0033).

**Conclusion:** There is increased incidence of subclinical cardiac abnormalities in chronic liver disease patients which increases and worsens with duration and severity of illness.

**Keywords:** Echocardiography, Chronic Liver Disease, Cardiovascular Changes, Pulmonary Arterial Hypertension, Cirrhotics, Cirrhotic Cardiomyopathy

numerous cardiac abnormalities, which includes increased cardiac output, left ventricular diastolic dysfunction, increased wall thickness of cardiac chambers, and pulmonary arterial hypertension.<sup>2,3</sup> Taking into consideration the wide variability of these different aspects, a clinical entity has been recently recognized, known as “cirrhotic cardiomyopathy” (CC), term first introduced by Lee et al. cirrhotic cardiomyopathy is a recently recognized condition in cirrhosis consisting of systolic incompetence under condition of stress, diastolic dysfunction related to altered diastolic relaxation and electrophysiological abnormalities in the absence of any known cardiac diseases.<sup>4,5</sup> Symptoms of overt heart failure is rare because of the peripheral vasodilatation characteristic of cirrhosis, in effect “auto treating” the ventricle by systemic vasodilatation reducing after load, and compensatory diminution of inhibitory influences such as the cardiac muscarinic system.<sup>6</sup> The cardiovascular abnormalities has been known for centuries, but only until relatively recently did the development of techniques for precisely measuring cardiovascular variables like echocardiography and MRI of heart is used for detecting the extent of these anomalies. Before this, clinicians observed the tachycardia and bounding pulses of patients with cirrhosis and opined about the hyper dynamic circulation A hyper dynamic systemic circulation with increased cardiac output and reduced systemic vascular resistance is present in roughly half of patients with end-stage liver disease.<sup>7</sup> High cardiac output can result in pulmonary artery shear forces that cause endothelial cell proliferation and increased smooth muscle cells in the vessel wall. A role has been suggested for vasoconstrictor substances such as endothelin.<sup>8</sup> Circulating levels of endothelin are increased in patients with advanced liver disease, and the presence of portosystemic shunts might increase the quantity of endothelin reaching the lung.<sup>8</sup> Other vasoconstrictor substances might also be released to produce increased pulmonary vascular resistance We undertook to study cardiac status in patients with cirrhosis of liver for assessment of the occurrence of cirrhotic cardiomyopathy, to study if echocardiographic parameters of cardiac dysfunction correlate with the severity of liver dysfunction, so we can detect the subclinical cardiac dysfunction in patient of chronic liver disease.

## INTRODUCTION

The spectrum of chronic inflammatory disease of liver extends from acute hepatitis to chronic hepatitis and finally to cirrhosis. Chronic hepatitis represents a series of liver disorder of varying causes and severity in which hepatic inflammation and necrosis continue for at least 6 months and demonstrated by persistently abnormal serum aminotransferase levels and characteristic histological findings. Chronic liver disease in the clinical context is a disease process of the liver that involves a process of progressive destruction and regeneration of the liver parenchyma leading to fibrosis and cirrhosis. Milder forms are non progressive or only slowly progressive, while more severe forms may be associated with scarring and architectural recognition, which when advanced leads ultimately to cirrhosis.<sup>1</sup> Cirrhosis is associated with

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## MATERIAL AND METHODS

The study was carried on 100 indoor patients with cirrhosis of liver admitted in the Department of Medicine, N.S.C.B. Medical College Hospital, Jabalpur, Madhya Pradesh. Diagnosis of chronic liver disease was made on the basis of clinical history and examination, biochemical and serological evaluation, and ultrasonographic imaging. For every selected case, a detailed history, thorough general and systemic examination and investigation were done, and then all patients were subjected for echocardiographic study to assess the cardiac status.

### Inclusion criteria

Patients of chronic liver disease diagnosed by

1. H/o jaundice for more than six month and signs of cirrhosis of liver e.g. hematemesis or melena or ascites, or splenomegaly or hepatomegaly
2. Altered LFT for more than six months, with
3. Ultrasound showing shrunken or nodular liver with features of portal hypertension OR
4. Biopsy if available showing cirrhosis.

### Exclusive criteria

- Patients with primary cardiac or pulmonary disease,
- Diagnosed hypertensive patients,
- Anemia (Hb less than 8 gm %).
- Diabetes mellitus
- Post-partum and pregnancy
- Uremic cardiomyopathy

### Following investigation were included in the study

- Complete blood count with ESR.
- B.urea, S.creatinine, Serum sodium., serum potassium

- Liver function test
- S. cholesterol, S. triglyceride, S. HDL, S. LDL, S. VLDL.
- CPK-MB, FBS, PPBS
- HBsAg, HCV, urine routine/ microscopy, Slit-lamp examination for KF ring
- Alphafeto protein(AFP)
- USAbdomen, X-ray chest PA view
- ECG/2D Echocardiography and colour Doppler study.

## STATISTICAL ANALYSIS

The data was fed into an excel spreadsheet and then tabulated. Data was statistically analyzed using t-test, chi-square test, Fisher's exact test using SPSS and Microsoft excel.  $p < 0.05$  was considered to be statistically significant.

## RESULTS

There was definite correlation between severity of cirrhosis and echocardiographic changes.

Based on Child Turcotte Pugh score for severity of cirrhosis, 43% of study subjects were in Child class A, 45% Class B, 12% in class C.

Diastolic dysfunction was found to be more in Child class C as compare to Child class B and Child class A. Systolic dysfunction was found to be more in Child class C as compare to Child class B and Child class A. Pericardial effusion was found to be Child class C as compare to Child class B and Child class A. Pulmonary arterial hypertension was found to be more in Child class C as compare to Child class B and Child class A. The incidence of cardiac abnormalities increased with duration of chronic liver disease. Incidence of diastolic dysfunction was 32% out of 100 ( $P = 0.00001$ ), Systolic dysfunction was 6% out of 100

Age (yrs)	Male	Female	Total
30-39	06 (46.1%)	07(53.8%)	13
40-49	27(67.5%)	13(32.5%)	40
50-59	05(50%)	05(50%)	10
60-69	31(91.1%)	03(8.8%)	34
>70	03(100%)	00	03
Total	72	28	100

**Table-1:** Age and sex distribution of study population

Etiology	Number
Alcohol	57
Chronic hepatitis B	20
Chronic hepatitis C	3
Hepatocellular Carcinoma	2
Others (Cryptogenic, Wilson disease, etc.)	18

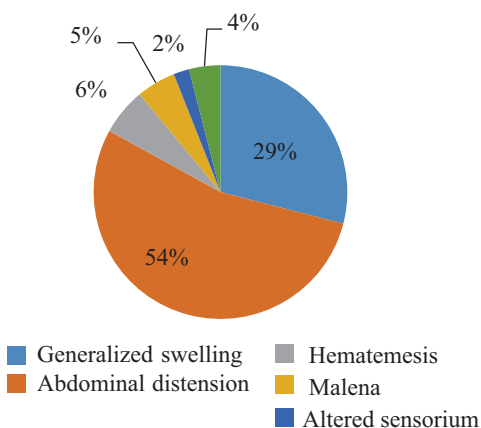
**Table-2:** Etiology of chirosis

Duration of chronic liver disease (months)	Echocardiographic changes				No Echo changes
	Diastolic Dysfunction	Systolic Dysfunction	Pericardial Effusion	Pulmonary Arterial Hypertension	
3-6 (n= 25)	04 (16%)	00	00	00	21 (84%)
6-12 (n=35)	12 (34.2%)	00	08 (25%)	02 (5.7%)	13 (37.1%)
12-24 (n=40)	16 (40%)	06 (15%)	14 (35%)	04 (10%)	00
Total (n=100)	32%	06%	22%	06%	34%

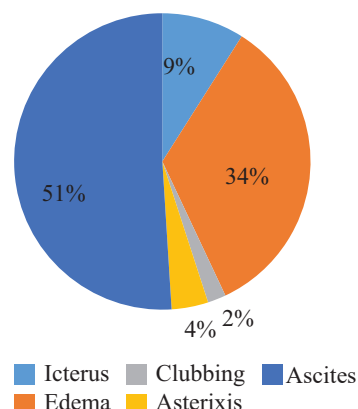
**Table-3:** Duration of chronic liver disease and cardiovascular changes in echocardiography

Severity As child pugh score	Echocardiographic changes				No echo changes
	DD	SD	PE	PAH	
A (n=43)	06 (13.9%)	00	00	00	37
B (n=45)	16 (35.5%)	03 (6.6%)	14(31.1%)	03 (6.6%)	09
C (n= 12)	10 (83.3%)	03 (25%)	08(66.6%)	03 (25%)	00
Total (n=100)	32	06	22	06	46

**Table-4:** Correlation of severity of chronic liver disease and cardiovascular changes in echocardiography



**Figure-1:** Distribution of cases according to symptoms and signs (n = 100)



**Figure-2:** Distribution of cases according to signs (n = 100)

(P = 0.0033), pericardial effusion was 22% out of 100 (P = 0.00001), Pulmonary arterial hypertension was 6% out of 100 (P = 0.0033).

**DISCUSSION**

The study cross sectional clinical study consisting of 100 patients with cirrhosis, out of 100 cases 72% were male and 28% were female and majority of cases belongs to age group of 40-49 years among which 27% were male and 13% were female respectively (Table 01). Majority of the patient presented with the symptoms of abdominal distension (54%) and Generalized swelling (29%), (figure 1). Ascites (51%), Edema (34%) and Icterus (9%) was the most common clinical sign observed (figure 2). Incidence of alcohol related cirrhosis of liver was found to be more 57% followed by chronic hepatitis B 20% and others (Cryptogenic, Wilson disease, etc) 18% (Table 2). Among the various cardiovascular disease abnormalities, the incidence of diastolic dysfunction (32 cases) was found to be increased with the duration of chronic liver disease 3-6 months (16%), 6-12 months 34.2%, 12-24 months 40%. Followed by pericardial effusion (22 cases) 3-6 months 0%, 6-12 months 25%, and 12-24 months 35%. In systolic dysfunction (6 cases) was observed in 12-14 months 6%. In pulmonary arterial hypertension (6 cases) was observed 6-12 months 5%, 12-14 months 10% (table 3). Among the cirrhotics 43 patients (43%) were in Child Pugh class A, 45 Patients (45%) were in severity class

B, 12 patients (12%) were in severity Class C (table 3). In child class B out of 45 cases 16 (35.5%) had diastolic dysfunction, 14 (31.1%) had pericardial effusion, 3 (6.6%) had systolic dysfunction and pulmonary arterial hypertension respectively. In class C out of 12 patients, 10 (83.3%) had diastolic dysfunction, 8 (66.6%) had pericardial effusion, 3 (25%) had systolic dysfunction and pulmonary arterial hypertension respectively. In Child Pugh class A out of 43 only 6 (13.9%) had echocardiographic changes in the form of diastolic dysfunction (table 4). This correlate with the study of Hurst TM et al.<sup>9,10</sup>

In our study there was definite association observed between the severity of hepatic dysfunction and cardiac changes which is concordant to few reports in the literature that cardiac changes parallel the severity of hepatic dysfunction in cirrhotics.<sup>11</sup>

Out of 100 cases incidence of diastolic dysfunction was found to be more in 32% of cases in the form of increased deceleration time and increase E/A ratio (P = 0.00001) this is concordant with the study of Dowsley et al.<sup>12</sup> pericardial effusion was 22% (P = 0.00001 < 0.05), this is concordant with the study of Zeki Karasu et al. 2004.<sup>13</sup> They found prevalence of pericardial effusion in 32% patients of cirrhosis. Incidence of pulmonary arterial hypertension was 6% (P = 0.0033 > 0.05) this is concordant with study of Rowen K Zetterman et al 2013. They found the prevalence of pulmonary arterial hypertension in 5% of cirrhosis.

Incidence of Systolic dysfunction was found in 6% (P = 0.0033), this was concordant with study report of echocardiography in chronic liver disease: systematic review.<sup>14</sup>

**CONCLUSION**

There was significant incidence of subclinical cardiac abnormalities observed in chronic liver disease patients which increase with duration of illness. Incidence of subclinical cardiac abnormalities also increases with severity of chronic liver disease. Early detection of subclinical cardiac changes is important to reduce morality and mortality in chronic liver disease patients.

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