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**Dr. Shailendra Singh Rajpoot**  
MD Medicine, Metro hospital  
and cancer research Center  
Jabalpur, Madhya Pradesh,  
India

## **An evaluation of hepatic parameters in congestive heart failure and its correlation with Aetiology and duration: a Prospective study**

**Dr. Shailendra Singh Rajpoot**

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### **Abstract**

**Aims:** The aim of the study to find out the prevalence of liver function abnormalities in heart failure patients, pattern of elevation of liver enzymes and correlation of liver function tests with etiology, duration and of heart failure.

**Material and methods:** This is a prospective study was conducted in the Department of General Medicine, Metro Hospital and Cancer Research Centre, Jabalpur, MP, India from October 2018 to January 2020. The hepatic biochemical parameters like serum bilirubin (direct, indirect and total), serum AST and ALT, Serum alkaline phosphatase, Serum proteins and Prothrombin time were estimated.

**Results:** In present study mean age of patient was  $57.68 \pm 11.78$  years. Maximum number of patients was from 50 to 75 years of age that is 45 (56.25%). As per NYSA classification maximum number of cases were class II (46.25%) followed by class III (26.25%). Percentage of patients with class I were 18.75% and class IV were 8.75%. Maximum number of patients has disease from to 4-year duration that is 66.25%. Regarding clinical presentation of patient's jaundice was present in 27.5%, hepatomegaly which was most commonly present that was 47.5%, ascites was present in 28.75% and congested hepatomegaly in USG (41.25%). Regarding hepatic biochemical parameters there is significant variation in serum bilirubin (mg/dl) parameter as per progress in class of heart failure ( $p=0.001$ ). Serum bilirubin was  $3.88 \pm 1.57$  mg/dl in class IV and least in class I that is  $1.132 \pm 0.28$  mg/dl. Serum AST was highest in class IV  $161.14 \pm 25.85$  IU and least in class I that is  $35.68 \pm 11.87$  IU ( $p=0.001$ ). Serum ALT was highest in class IV  $188.98 \pm 35.85$  IU and least in class I that is  $35.11 \pm 10.56$  ( $p=0.001$ ).

**Conclusion:** The heart failure was common in fifth and sixth decade of life and there was male predominance.

**Keywords:** AST, ALT, Congestive heart failure

### **Introduction**

Heart failure (HF) is a widespread and serious problem that has been reported in many countries [1]. Nohria-Stevenson profiles demonstrated the clinical importance of assessments of perfusion ("cold" versus "warm"), as well as congestion ("wet" versus "dry") [2, 3]. The abdominal compartment, which includes the liver, splanchnic vasculature, gut, and so on, has recently been investigated to determine whether it significantly contributes to a deranged cardiac function as well as multiple organ function in patients with HF [4, 5]. HF causes liver dysfunction with a combination of reduced arterial perfusion and passive congestion, and this association is called "cardio hepatic interaction" [6, 7]. With regard to liver function tests (LFTs), liver dysfunction, such as the elevation of serum bilirubin, ALP, gamma-glut amyl transferase, AST, and ALT, frequently occurs in HF related to reduced arterial perfusion and passive congestion, and is associated with disease severity and prognosis [5, 7, 8]. Liver congestion attributable to increased central venous pressure might directly contribute to a state of impaired natriuresis [5, 9]. In addition, elevated central venous pressure and right atrial pressure (RAP) may contribute to cholestatic abnormalities (elevated bilirubin, ALP, gamma-glutamyl transferase), as well as impairment of both hepatocyte function and liver reserve in patients with HF [6]. With regard to image testing, evaluation of chronic liver disease based on liver stiffness (LS) assessed by transient elastography has attracted growing interest in the field of clinical hepatology. LS is recently calculated on the basis of shear wave velocity measurements, and is used as a noninvasive method to assess liver fibrosis.

**Corresponding Author:**  
**Dr. Shailendra Singh Rajpoot**  
MD Medicine, Metro hospital  
and cancer research Center  
Jabalpur, Madhya Pradesh,  
India

It has been reported that LS is highly reflective of right-sided filling pressure, and might be a marker of liver congestion in patients with HF [10, 11]. Congestive hepatopathy [6, 7] attributable to HF causes functional abnormalities of the liver, and increased LS indicates adverse prognosis [12] Fouad *et al.* has concluded that heart failure is associated with manifestations of liver failure and laboratory data specific to ischemic hepatitis or congestive hepatopathy [13] Auer *et al.* has reported that elevated liver enzymes are common in patients with HF [14]. Saner *et al.* has concluded that congestive heart failure should always be considered as a possible cause of acute liver failure [15]. It is clear that hepatic abnormalities are associated with heart failure. With this view present study has been designed to study the prevalence of liver function abnormalities in heart failure patients, pattern of elevation of liver enzymes and correlation of liver function tests with etiology, duration and of heart failure.

### Material and methods

This is a prospective study was conducted in the Department of General Medicine India from October 2018 to January 2020, after taking the approval of the protocol review committee and institutional ethics committee. After taking informed consent detailed history was taken from the patient. The technique, risks, benefits, results and associated complications of the procedure were discussed with all patients.

### Methodology

Total 80 patients with clinically and echocardiographic ally diagnosed of heart failure were include in this study. Patients with pre-existing hepatic disorder, Use of hepatotoxic drug, chronic alcoholic were exclude from this study.

All patients fechocardiographic ally. Various demographic parameters like age sex duration of disease were recorded on predesigned Performa. The hepatic biochemical parameters like serum bilirubin (direct, indirect and total), serum AST and ALT, Serum alkaline phosphatase, Serum proteins and Prothrombin time were estimated. For estimation of above parameters ebra EM 200 biochemistry analyser was used. All parameters were compared based on NYSA classification and duration of disease [16, 17].

### Statistical analysis

Data were recorded in excel sheet and statistical Analysis was done with software SPSS-14 version. Qualitative data were calculated as percentage and proportions and were analysed by chi-square test. Quantitative data were expressed as mean  $\pm$  SD and these data were analysed by unpaired student t test. The p value less than 0.05 were taken as significant.

### Results

In present study 80 patients with various class and duration of heart failure were enrolled for this study for evaluation of changes in hepatic parameters. In our study as per table 1 mean age of patient was  $57.68 \pm 11.78$  years. Number of

patients less than 25 years was 3(3.37%), from 25 to 50 years were 13 (16.25%). Maximum number of patients was from 50 to 75 years of age that is 45 (56.25%). Number of patients above 75 years of age was 19 (23.75%). There was male predominance 58(72.5%). As per NYSA classification maximum number of cases were class II (46.25%) followed by class III (26.25%). Percentage of patients with class I were 18.75% and class IV were 8.75%. Regarding duration of disease 12.5% patients have disease since less than one year. Maximum number of patients has disease from to 4-year duration that is 66.25%. Duration of disease was more than 4 year in 21.25% patients.

**Table 1:** Demography of patients with heart failure.

Parameter		Number	Percentage (%)
Age (mean $57.68 \pm 11.78$ year)	Below 25year	3	3.37
	25 to 50	13	16.25
	50 to 75	45	56.25
	Above 75	19	23.75
Sex	M	58	72.5
	F	22	27.5
NYSA class	Class I	15	18.75
	Class II	37	46.25
	Class III	21	26.25
	Class IV	7	8.75
Duration of disease	Less than 1 year	10	12.5
	1 to 4year	53	66.25
	More than 4year	17	21.25

Regarding clinical presentation of patient's jaundice was present in 27.5%, hepatomegaly which was most commonly present that was 47.5%, ascites was present in 28.75% and congested hepatomegaly in USG (41.25%).

**Table 2:** Clinical presentation of patients with heart failure

Clinical parameter	N (n=60)	Percentage (%)
Jaundice	21	27.5
Hepatomegaly	38	47.5
Ascites	23	28.75
Congested hepatomegaly in USG	33	41.25

Regarding hepatic biochemical parameters there is significant variation in serum bilirubin (mg/dl) parameter as per progress in class of heart failure ( $p=0.001$ ). Serum bilirubin was  $3.88 \pm 1.57$  mg/dl in class IV and least in class I that is  $1.132 \pm 0.28$  mg/dl. Serum AST was highest in class IV  $161.14 \pm 25.85$  IU and least in class I that is  $35.68 \pm 11.87$  IU ( $p=0.001$ ). Serum ALT was highest in class IV  $188.98 \pm 35.85$  IU and least in class I that is  $35.11 \pm 10.56$  ( $p=0.001$ ). Serum ALP was highest in class IV  $62.27 \pm 15.32$  IU and least in class I that is  $39.48 \pm 8.85$  ( $p=0.01$ ). Serum total protein (g/dl) was decreased as the heart failure progressed least in class IV  $3.59 \pm 1.47$  g/dl and highest in class I that is  $6.78.14 \pm 2.14$  gm/dl ( $p=0.05$ ). Serum albumin (g/dl) was least in class IV  $2.79 \pm 0.82$  g/dl and highest in class I that is  $4.75 \pm 0.85$  gm/dl ( $p=0.034$ ). Prothrombin time (sec) was highest in class IV  $23.24 \pm 6.11$  sec and least in class I that is  $13.12 \pm 3.36$  sec ( $p=0.01$ ).

**Table 3:** Liver biochemical parameters of patients in comparison with class of heart failure

Parameter	Class I	Class II	Class III	Class IV	P value
Serum bilirubin (mg/dl)	1.132±0.28	1.64±0.62	2.35±0.74	3.88±1.57	0.001
Serum AST IU	35.68±11.87	52.75±20.68	89.57±13.89	161.14±25.85	0.001
Serum ALT IU	35.11±10.56	45.23±11.24	85.36±13.22	188.98±35.85	0.0001
Serum ALP IU	39.48±8.85	43.26±12.55	53.83±11.86	62.27±15.32	0.01
Serum total protein (g/dl)	6.78.14±2.14	5.34±2.11	5.05±2.05	3.59±1.47	0.05
Serum albumin (g/dl)	4.75±0.83	3.29±0.79	3.12±0.51	2.79±0.82	0.034
Prothrombin time (sec)	13.12±3.36	15.06±8.95	18.23±4.31	23.24±6.11	0.01

Regarding comparison of liver biochemical parameters in patients with duration of heart failure as per table 4 it is clear that serum bilirubin was increased with the duration of disease. The mean value of serum bilirubin (mg/dl) in patients with duration of disease more than 4 year was 3.11±1.17 mg/dl was significantly higher than the patients with duration of disease less than 4 year significantly (p=0.02). Serum AST was highest with duration of disease more than 4 year 112±26.34 IU and least in patients with duration of disease less than 4 year that is 40.57±8.94 IU (p=0.001). Serum ALT was highest with duration of disease more than 4 year 159.87±26.38 IU and least in patients with duration of disease less than 4 year that is 34.12±8.94 IU (p=0.001). Serum ALP IU was highest with duration of

disease more than 4 year 60.12±10.14 IU and least in patients with duration of disease less than 4 year that is 40.15±4.57 IU (p=0.02). Serum total protein (g/dl) was least with duration of disease more than 4 year 4.12±2.22 g/dl and normal in patients with duration of disease less than 4 year that is 6.77±1.58 g/dl (p=0.029). Serum albumin (g/dl) was least with duration of disease more than 4 year 2.77±1.44 g/dl and normal in patients with duration of disease less than 4 year that is 3.84±0.79 g/dl (p=0.14). Prothrombin time (sec) was highest with duration of disease more than 4 year 20.11±3.22 sec and least in patients with duration of disease less than 4 year that is 13.79±2.68 sec (p=0.01).

**Table 4:** Liver biochemical parameters of patients in comparison with duration of heart failure

Parameter	less than 1 year	1 to 4 years	more than 4 years	P value
Serum bilirubin (mg/dl)	1.09±0.4	1.98±0.56	3.11±1.17	0.02
Serum AST IU	40.57±8.94	48.11±6.14	112 ±26.34	0.001
Serum ALT IU	34.12± 8.94	79.65± 8.45	159.87± 26.38	0.000
Serum ALP IU	40.15± 4.57	44.85±10.14	60.12±10.14	0.02
Serum total protein (g/dl)	6.77±1.58	5.94±1.89	4.12±2.22	0.029
Serum albumin (g/dl)	3.84±0.79	3.01±1.22	2.77±1.44	0.14
Prothrombin time (sec)	13.79±2.68	15.76±3.45	20.11±3.22	0.01

## Discussion

Heart failure as a cause of acute liver failure is less documented and poorly understood condition. Auer *et al.* have concluded that hepatic enzymes are elevated in heart failure patients. Pattern of change in hepatic enzyme differ as per in patients with chronic and acute decompensate HF and are surrogates of the type of hemodynamic alterations [13, 14]. Shah *et al.* has concluded that hepatic injury as a consequence of heart failure is common but less recognized syndrome [18]. In present study we have observed that mean age of patient was 57.68±11.78 years and maximum number of patients was from 50 to 75 years of age. There was male predominance. This finding is supported by Van Deursen *et al.* [19]. Most of the patients were in class III and class IV group and duration of disease was from 1 with higher class of heart failure than class I. This corroborates with the work of Allen *et al.* [20].

We have observed that hepatic biochemical parameters were significantly elevated in patients with higher class of heart failure than class I. in our study serum total protein (g/dl) was decreased as the heart failure progressed least in class IV 3.59±1.47 g/dl and highest in class I that is 6.78.14±2.14 gm/dl (p=0.05). Serum albumin (g/dl) was least in class IV 2.79±0.82 g/dl and highest in class I that is 4.75±0.85 gm/dl (p=0.034). Serum total protein (g/dl) and albumin was significantly decreased in class III and class IV patients in comparison to class I and class II to 4 years. Alvarez has concluded that may cause elevations of liver enzymes and both direct and indirect serum bilirubin and marked

elevations in serum aminotransferases which support our study.<sup>21</sup> Nikolaou *et al.* has concluded that Abnormal LFTs were present in about a half of patients presenting with heart failure which corroborates with our finding [22]. Samsky *et al.* has reported that severity of hepatic damage increases with duration of disease which supports our study [23]. Naschitz *et al.* has concluded that the spectrum of heart diseases affecting the liver includes mild alterations of liver function tests in heart failure, cardiogenic ischemic hepatitis, congestive liver fibrosis, and cardiac cirrhosis which progress with the progress of disease which support our study. Has reported that liver function abnormalities remain common in patients with congestive heart failure but are generally small in magnitude and not associated with clinically apparent hepatic disease which contradict our study [24].

## Conclusion

We can conclude that heart failure was common in fifth and sixth decade of life and there was male predominance. Congested hepatomegaly was common presentation jaundice and ascites was also common. Change in biochemical parameters was increased with severity and duration of heart disease.

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