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ORIGINAL ARTICLE

A prospective study of hepatic markers in congestive heart failure patients

Amita Khiwani

Assistant Professor, Department of Biochemistry, Rama Medical College Hospital & Research Centre, Hapur, Uttar Pradesh, India

ABSTRACT:

Aim: The study's goal is to determine the frequency of liver function abnormalities in heart failure patients, the pattern of elevation of liver enzymes, and the connection of liver function tests with the aetiology, duration, and severity of heart failure. **Material and methods:** This is a prospective study was conducted in the Department Biochemistry. 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:** 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±1.57 mg/dl in class IV and least in class I that is 1.132±0.28 mg/dl. Serum AST was highest in class IV 161.14±25.85 IU and least in class I that is 35.68±11.87 IU (p=0.001). Serum ALT was highest in class IV 188.98±35.85 IU and least in class I that is 35.11±10.56 (p=0.001). Serum ALP was highest in class IV 62.27±15.32 IU and least in class I that is 39.48±8.85 (p=0.01). 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). Prothrombin time (sec) was highest in class IV 23.24±6.11 sec and least in class I that is 13.12±3.36 sec (p=0.01). 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). **Conclusion:** In conclusion, we found that heart failure was most prevalent in men's sixth and seventh decades. Ascites and jaundice were also prevalent, as was a swollen liver. The severity and duration of cardiac disease were both shown to be predictive of the degree of change in biochemical markers.

Keywords: Biochemical markers, Liver, Heart failure

Corresponding author: Amita Khiwani, Assistant Professor, Department of Biochemistry, Rama Medical College Hospital & Research Centre, Hapur, Uttar Pradesh, India

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INTRODUCTION

Heart failure (HF) is a common and significant condition that has been observed in a number of nations.[1] Nohria-Stevenson profiles highlighted the clinical significance of perfusion ("cold" vs "warm") and congestion ("wet" versus "dry").[2,3] The abdominal compartment, which comprises the liver, splanchnic vasculature, intestines, and other organs, has lately been studied to see whether it contributes substantially to impaired cardiac performance as well as multiple organ function in HF patients. [4,5] HF produces liver damage by a combination of decreased arterial perfusion and passive congestion, which is referred to as "cardiohepatic interaction." [6,7] In terms of liver function tests (LFTs), liver dysfunction, such as elevated serum bilirubin, ALP, gamma-glutamyl transferase, AST, and ALT, is common in HF due to decreased arterial perfusion and passive congestion, and is linked with disease severity and prognosis. [5,7,8] Liver congestion related to elevated central venous pressure could directly lead to a condition of impaired natriuresis. Elevated central venous pressure and right atrial pressure (RAP) may also contribute to cholestatic abnormalities (elevated bilirubin, ALP, gamma-glutamyl transferase) and deterioration of both hepatocyte function and liver reserve in HF patients.[6] With reference to imaging testing, assessment of chronic liver disease based on liver stiffness (LS) evaluated by transient elastography has garnered considerable attention in the area of clinical hepatology. LS is a noninvasive approach for assessing liver fibrosis that was recently derived using shear wave velocity data. It has been noted that LS is strongly reflective of right-sided filling pressure, and could be a sign of liver congestion in individuals with HF.[10,11] Congestive hepatopathy[6,7] related to HF induces functional abnormalities of the liver, and higher LS implies bad prognosis. [12] Fouad et al has determined that heart failure is related with signs of liver failure and test evidence specific to ischemic

hepatitis or congestive hepatopathy.[13] According to Auer et al, increased liver enzymes are prevalent in HF patients. [14] According to Saner et al, congestive heart failure should always be recognised as a potential cause of acute liver failure. It is obvious that hepatic disorders are linked to heart failure. With this in mind, the current research was conducted to investigate the incidence of liver function abnormalities in heart failure patients, the pattern of elevated liver enzymes, and the connection of liver function tests with the aetiology, duration, and severity of heart failure.[15]

METHODS AND MATERIALS

This is a prospective research was done at the Department of Biochemistry, after obtaining the permission of the protocol review committee and institutional ethics committee. Following informed permission, a complete history was obtained from the patient. All patients were informed about the procedure's approach, risks, advantages, outcomes, and related complications. This research included 80 individuals who were clinically and echocardiographically diagnosed with heart failure. Patients having a pre-existing hepatic disease, hepatotoxic medication use, or a history of alcoholism were excluded from this research.

All individuals recruited in this trial were clinically and echocardiographically examined. Various demographic information including age sex length of sickness were recorded on predesigned Performa. Serum bilirubin (direct, indirect, and total), serum AST and ALT, serum alkaline phosphatase, serum proteins, and prothrombin time were all estimated. For estimate of aforementioned parameters biochemistry analyser was employed. All indicators were compared using the NYSA categorization and sickness duration. [16,17]

Data were entered into an excel spreadsheet, and statistical analysis was performed using the SPSS-25.0 programme. The chi-square test was used to analyse qualitative data, which were computed as percentages and proportions. The quantitative data were represented as mean SD and analysed using the unpaired student t test. A p value of less than 0.05 was considered 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±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±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±1.57 mg/dl in class IV and least in class I that is 1.132±0.28 mg/dl. Serum AST was highest in class IV 161.14±25.85 IU and least in class I that is 35.68±11.87 IU (p=0.001). Serum ALT was highest in class IV 188.98±35.85 IU and least in class I that is 35.11±10.56 (p=0.001). Serum ALP was highest in class IV 62.27±15.32 IU and least in class I that is 39.48±8.85 (p=0.01). 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). Prothrombin time (sec) was highest in class IV 23.24±6.11 sec and least in class I that is 13.12±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.[21] 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

In conclusion, we found that heart failure was most prevalent in men's sixth and seventh decades. Ascites and jaundice were also prevalent, as was a swollen liver. The severity and duration of cardiac disease were both shown to be predictive of the degree of change in biochemical markers.

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