



RELATIONSHIP BETWEEN THE EJECTION FRACTION IN ECHOCARDIOGRAPHY WITH LIVER FUNCTION IN HEART FAILURE PATIENTS

Medicine

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ABSTRACT

Background: Heart failure (HF) is a complex clinical syndrome, which is based on the inability of the heart to pump blood throughout the body adequately, due to structural and functional disorders of the heart. The most common cause of left ventricular myocardial dysfunction. Heart failure is described by the measurement of left ventricular (LV) ejection fraction (LV). Heart failure with decreased ejection fraction (HFrEF) is characterized by LVEF $\leq 40\%$; preserved EF (HFpEF) is characterized by LVEF $\geq 50\%$ assessed by dopplerocardiography. In heart failure, the heart cannot supply oxygen adequately, so it can cause damage to other organ systems, such as the liver. It is important to identify from the outset of liver biochemical abnormalities in patients with heart failure, because the examination is useful in assessing the severity and duration of heart failure.

Aim: To determine the relationship between ejection fraction on echocardiography and liver function in heart failure patients.

Method: This cross-sectional study was conducted at the H. Adam Malik General Hospital in Medan in June 2017 until the research sample was fulfilled. Heart failure patients performed echocardiography and blood tests: SGOT, SGPT, Bilirubin, ALP, GGT, Albumin. Data analysis (Chi-square / fisher exact test) using SPSS.

Result: Subjects were male 36 patients (69.2%), and women 16 patients (30.8%), with an average age of 52.08 ± 10.52 years. The frequency of increasing total bilirubin and GGT is greater than for other liver functions. Liver function characteristics of SGOT, SGPT, total bilirubin, ALP, and GGT had a higher mean of ejection fraction $\leq 40\%$ compared to ejection fraction $> 40\%$. With the analysis of the Fisher Exact test p value < 0.05 for the relationship of Ejection Fraction to total bilirubin ($p = 0.001$) and GGT ($p = 0.016$).

Conclusion: There is a relationship between ejection fraction and liver function and what is meaningful is total bilirubin with GGT.

KEYWORDS

Ejection fraction, SGOT, SGPT, Bilirubin, ALP, GGT, Albumin.

INTRODUCTION

Heart failure (HF) is clinically complex, based on the inability of the heart to pump blood throughout the body tissues adequately, due to structural and functional disorders of the heart.¹ In the United States around 5.1 million people experience heart failure and around 50% die within 5 years after diagnosed.² The prevalence of heart failure based on an interview diagnosed by a doctor in Indonesia is 0.13% and those diagnosed with a doctor or symptom are 0.3%. North Sumatra alone is around 0.13% with the highest prevalence at the age of 65-74 years.³

The most common cause of heart failure is left ventricular myocardial dysfunction.² Heart failure is described using measurements of left ventricular (LV) ejection fraction (LV). Heart failure with a decrease in ejection fraction (HFrEF) is characterized by LVEF $\leq 40\%$ called systolic heart failure; heart failure with a preserved EF (HFpEF) fraction characterized by LVEF $\geq 50\%$, called diastolic heart failure.² The diagnosis is made by doppler-echocardiographic examination of mitral blood flow and pulmonary venous flow.⁴

Sankar et al. Sought the relationship of ejection fraction with liver function in patients with heart failure; reported that patients who had EF $\leq 40\%$ had an increase in liver function by 92.5%, while patients with EF $> 40\%$ increased liver function around 61.7%. It was concluded that the incidence of liver dysfunction was related to the degree of heart failure or EF.⁵ Identification of the onset of abnormalities and providing adequate treatment of the underlying causes of heart failure can restore liver function and prevent permanent damage.⁶ In heart failure, the heart is not can supply oxygen adequately according to tissue metabolic needs, so that it can cause damage to other organ systems, such as the liver.²

Congestive hepatopathy (CH) and acute cardiogenic liver injury (ACLI) are terms used to describe the presence of liver damage caused by heart abnormalities.² The main pathophysiology of Congestive Hepatopathy (CH) is due to passive congestive veins; while acute cardiogenic liver injury (ACLI) is associated with acute cardiac circulatory failure (decreased cardiac output and arterial hypoperfusion).²

METHOD

Patient Selection

This study is an analytical cross-sectional study to determine the

relationship between ejection fraction on echocardiography and liver function in heart failure patients. The study was conducted in the inpatient room at the HAM Medan Hospital starting in June 2017. The population was all heart failure patients who were hospitalized who met the inclusion criteria. Inclusion criteria: a. Patients with heart failure are enforced based on Framingham criteria, b. > 18 years old, c. The subject receives information and gives consent to participate in informed and voluntary research. Exclusion criteria are: a. HBsAg patients are positive, b. Patients with positive anti-HCV, c. Pregnant patients, d. Patients receiving hepatotoxic drugs, e. Patients with hemolytic anemia, f. Hepatitis patients, g. Cholestatic patients, h. Liver cirrhosis (based on clinical) and other chronic liver diseases. The sample size needed in this study was 47 people. The selected sample signed a written agreement to take part in the study. Taking blood samples for laboratory tests of liver function (SGOT, SGPT, Bilirubin, ALP, GGT, albumin), then performed echocardiographic Doppler examination. This study was approved by the local ethics committee.

Statistical Methods

Chi-square / fisher exact test was used to determine the relationship between ejection fraction and liver function in heart failure patients. Statistical analysis was performed with SPSS 22nd version software. For all statistical tests with p value < 0.05 it was considered statistically significant.

RESULTS

Male subjects were 36 patients (69.2%), and female sex were 16 patients (30.8%), and the average age was 52.08 ± 10.52 years. In this study liver function and ejection fraction variables were used as categorical variables, which can be seen in table 1.

Table 1. Characteristics of liver function and ejection fraction of research subjects

Liver Function	n(%)
SGOT	
< 34 U/L	27 (51,9)
> 34 U/L	25 (48,1)
SGPT	
< 55 U/L	40 (76,9)
> 55 U/L	12 (23,1)

Total Bilirubin	
< 1.2 mg/dL	20 (38,5)
> 1.2 mg/dL	32 (61,5)
ALP	
< 150 U/L	37 (71,2)
> 150 U/L	15 (28,8)
GGT	
< 36 U/L	3 (5,8)
> 36 U/L	49 (94,2)
Albumin	
< 3.5 g/dL	47 (9,4)
> 3.5 g/dL	5 (9,6)
Ejection Fraction	
< 40 %	38 (73,1)
> 40 %	14 (26,9)

SGOT: Serum Glutamic Oxalo-acetic Transaminase ; **SGPT:** Serum Glutamic Piruvic Transaminase; **ALP:** Alkaline Phosphatase; **GGT:** Gamma Glutamyl Transpeptidase

In table 1. there is a higher frequency of increased total bilirubin and GGT than other liver functions. The characteristics of liver function in Table 2 show that SGOT, SGPT, total bilirubin, ALP, and GGT had a higher mean of ejection fraction <40% compared to ejection fraction >40%.

Table 2 Characteristics of liver function based on Ejection Fraction

Liver function	Ejection Fraction	
	EF < 40 %	EF > 40%
SGOT (U/L)	80,21 ± 131,49	41,43 ± 57,16
SGPT (U/L)	73,26 ± 123,894	44,79 ± 49,64
Total Bilirubin (mg/dl)	3,12 ± 2,27	1,46 ± 2,31
ALP (U/L)	129,32 ± 62,29	91,29 ± 59,88
GGT (U/L)	124,21 ± 42,13	102,64 ± 65,82
Albumin (g/dL)	2,92 ± 0,45	3,08 ± 0,49

Table 3 Relationship of Ejection Fraction to liver function (Chi-Square analysis)

Liver function	Ejection Fraction (n)		p
	EF < 40 %	EF > 40%	
SGOT	18	9	0,279
< 34 U/L			
> 34 U/L	20	5	0,712
SGPT	30	10	
< 55 U/L			
> 55 U/L	8	4	
Total Bilirubin	9	11	0,001
< 1.2 mg/dL			
> 1.2 mg/dL	29	3	0,300
ALP	25	12	
< 150 U/L			
> 150 U/L	13	2	
GGT	0	3	0,016
< 36 U/L			
> 36 U/L	38	11	
Albumin	3	2	
< 3.5 g/dL			0,602
> 3.5 g/dL	35	12	

In the table above, there is a p value <0.05 for the relationship of Ejection Fraction to total bilirubin (p = 0.001) and GGT (p = 0.016) based on the Fischer Exact test. The analysis concluded that there was a statistically significant relationship between the Ejection fraction of total bilirubin and GGT.

DISCUSSION

In this study heart failure patients had 36 male (69.2%) male characteristics, and 16 patients (30.8%) women. This is in accordance with the literature which states that heart failure mostly occurs in men, because coronary risk factors commonly occur in men and the rate of treatment of heart failure occurs mostly in men, whereas in women it often occurs in elderly women.⁷

The average age in this study was 52.08 ± 10.52 years. This is not in accordance with the literature which says that heart failure is a condition that occurs in the elderly in general, and contributes to the

increased incidence of HF.⁸ Although one study shows that in Africa, HF patients are younger than in other regions, with most being NYHA class III / IV and have valve disease, and half of heart failure patients are male and 29% have HFpEF. In Asia the proportion of coronary artery disease is the main etiology of heart failure, and more than half of the population of heart failure is male and has hypertension.⁹

Characteristics of liver function in this study showed that SGOT, SGPT, total bilirubin, ALP, and GGT had a higher mean of ejection fraction <40% compared to ejection fraction > 40%. This is consistent with the theory which states that there is an increase in liver function in heart failure patients. Heart failure often results in liver damage. This is based on the fact that the liver receives up to 25% of cardiac output, so that liver function is very sensitive to decreased blood flow. Laboratory features mainly show cholestasis, with an increase in serum g-glutamyl-transpeptidase, alkaline phosphatase, and bilirubin, while transaminases are often normal or moderately elevated, except in severe heart failure.¹⁰

The research conducted by the Acute Study of Clinical Effectiveness of Decreased Heart Failure (ASCEND-HF) by Marc D et al. Showed that patients with heart failure generally had elevated liver function values, and EF <50% was said to have a significant difference in increased bilirubin (p<0.001). The study also found no relationship between aminotransferase. This condition is suspected of exclusion criteria such as hypotension, conditions requiring intravenous inotropic, and acute coronary syndromes, which are later suspected to contribute to an increased risk of ACLI. In patients with hemodynamically unstable heart failure, hypotensive conditions alone are not always enough to cause an increase in aminotransferase levels.¹¹

Huan Zheng et al analyzed 327 heart failure patients and compared with 200 healthy control samples. In this study showed a significant difference in total bilirubin levels in the severity of Ejection Fraction (p = 0.001).¹²

CONCLUSION

There is a significant relationship between ejection fraction and liver function, namely total bilirubin and GGT.

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