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### Relationship between Albumin Levels and the Incidence of Ascites in Patients with Liver Cirrhosis

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#### ABSTRACT

**Background:** Patients with cirrhosis often develop hypoalbuminemia. In conditions of hepatic dysfunction, albumin synthesis is decreased due to hepatic dysfunction and abnormal distribution of portal blood flow. Ascites is a major complication and an important sign in the course of cirrhosis and is associated with 50% mortality after two years. 75% of patients' ascites etiology is liver cirrhosis, 10% malignancy, 3% heart failure, 2% tuberculosis, 1% pancreatitis, and others. **Methods:** This cross-sectional study was conducted from the medical records of patients with liver cirrhosis who were treated at the internal medicine section of Dr. M Djamil General Hospital, Padang, in 2015-2020. Patients with heart defects, malignancy, tuberculosis, pancreatitis, kidney failure, and incomplete medical record data were excluded from the study. Patients were grouped according to the presence or absence of ascites and albumin levels. Analysis using the chi-square test in 2020. **Results:** From 225 cases, 103 cases were analyzed. 77 were men (74.8%), and 26 were women (25.2%). The age of the patient was in the range of 40-60 years. No ascites were found in 30 people (29.1%), and 73 people (70.9%) had ascites. From normal albumin levels, five were without ascites, and four were with ascites. On mild hypoalbumin, 13 had no ascites, and 38 people had ascites. On severe hypoalbumin, 12 people were without ascites and 31 with ascites. A chi-square test was analyzed, and it was found that there was no relationship between the incidence of ascites and albumin levels (p 0.182). **Conclusion:** The incidence of ascites is not related to blood albumin levels.

#### 1. Introduction

Patients with cirrhosis are often found with hypoalbuminemia, which is mainly due to reduced hepatic synthesis ability, but it is recognized that the associated factors are multifactorial. In hepatic dysfunction, albumin synthesis is decreased due to hepatic dysfunction itself and abnormal distribution of portal blood flow. Decreased intravascular volume is frequently seen in cirrhotic patients, leading to activation of the renin-angiotensin system and increased release of the antidiuretic hormone, which results in salt and water retention, well as decreased renal perfusion and glomerular filtration rate (GFR). This mechanism causes ascites and hepatorenal

syndrome (HRS). Albumin synthesis only occurs in the liver at a rate of formation of 12-25 grams/day. Under normal circumstances, only 20-30% of hepatocytes produce albumin. However, the rate of this product varies depending on the state of the disease and the rate of nutrition because albumin is only formed in a suitable osmotic, hormonal, and nutritional environment. The colloid osmotic pressure of the interstitial fluid that moistens the hepatocytes is an essential regulator of albumin synthesis.<sup>1-5</sup>

Ascites is a major complication of cirrhosis, occurring in approximately 50% of patients older than ten years with cirrhosis. The presence of ascites is an important sign in cirrhosis and is associated with a

50% mortality after two years and significantly requires transplantation as the treatment of choice. In general, 75% of patients with ascites are due to cirrhosis of the liver, and the rest are due to malignancy 10%, heart failure 3%, tuberculosis 2%, pancreatitis 1% and other causes. Albumin has been used to reduce ascites formation in cirrhosis and improve circulation and kidney function. These results are supported by various research results that are only based on experience and are not supported by prospective studies.<sup>6-10</sup> This study aimed to determine the relationship between albumin levels and the incidence of ascites in cirrhotic hepatic patients.

## 2. Methods

This study was an analytic observational study with a cross-sectional approach and used secondary data sourced from medical records at the medical records installation of Dr. M. Djamil General Hospital, Padang, Indonesia. A total of 103 research subjects were included in this study. The research subjects met the inclusion criteria, namely patients who were treated at the internal medicine polyclinic at Dr. M. Djamil General Hospital, Padang, Indonesia, 2015-2020 period and have complete medical record data.

This study was approved by the medical and health research ethics committee at Dr. M. Djamil General Hospital, Padang, Indonesia.

This study observed sociodemographic data, clinical data, and laboratory data of research subjects. Research subjects were classified as normal albumin if they had albumin levels  $\geq 3.5$  g/dl, mild hypoalbuminemia if albumin levels were 2.5-3.4 g/dl, severe hypoalbuminemia if albumin levels were  $< 2.5$  g/dl. Data analysis was performed with the help of SPSS software version 25. Univariate analysis was performed to present the data frequency distribution for each test variable. Bivariate analysis was carried out to determine the relationship between albumin levels and the incidence of ascites in patients with hepatic cirrhosis, with a p-value  $< 0.05$ .

## 3. Results

Table 1 presents the baseline characteristics of the research subjects. The majority of research subjects were male and aged between 51-60 years. The study subjects had an average albumin level of 2.6 g/dL, which was at the level of mild hypoalbuminemia. The majority of research subjects also experienced ascites.

Table 1. Baseline characteristics of research subjects.

Variable	Frequency (%)	Mean (SD)
Gender		
Male	77 (74.8)	
Female	26 (25.2)	
Age (Year)		54.22(11,18)
31-40	14 (13,6)	
41-50	25 (24,3)	
51-60	30 (29.1)	
61-70	27 (26,2)	
>70	7 (6.8)	
Albumin levels		2,6 (0,6)
Ascites		
Yes	73 (70,9)	
No	30 (29,1)	

Table 2 presents the relationship between albumin levels and the incidence of ascites in patients with liver cirrhosis. The results of the study showed that there were many subjects without ascites who had hypoalbuminemia (mild and severe levels). Similar results were also seen in study subjects with ascites,

where it was found that the majority of research subjects had hypoalbuminemia, both mild and severe. This shows that there is no relationship between albumin level and the incidence of ascites in patients with hepatic cirrhosis.

Table 2. The relationship between albumin levels and the incidence of ascites in patients with liver cirrhosis.

Ascites	Albumin level			Total	p-value*
	Normal	Mild hypoalbuminemia	Severe hypoalbuminemia		
No	5	13	12	30	0,182
Yes	4	38	31	73	
Total	9	51	43	103	

#### 4. Discussion

Ascites in cirrhosis occur mainly due to the development of portal hypertension. As portal hypertension progresses, local vasodilators are released. These vasodilators will affect the splanchnic arteries and thereby decrease arterial pressure and adequate blood flow. Progressive vasodilation leads to the activation of vasoconstrictor and anti-natriuretic mechanisms, both of which attempt to restore normal perfusion pressure. The mechanism involved is the renin-angiotensin system, the sympathetic nervous system, and the antidiuretic hormone (vasopressin), eventually causing water and sodium retention. In the late stages of cirrhosis, water accumulation is more pronounced than sodium retention and causes dilutional hyponatremia.<sup>11-14</sup>

Ascites represent the accumulation of fluid in the peritoneal cavity. This condition is more often due to complications of cirrhosis, where in the USA found, ± 85% of cases. In the last ten years, after the diagnosis of cirrhosis is made, approximately 50% of patients will develop cirrhosis. The occurrence of ascites is the final result of the anatomical, pathophysiological, and biochemical changes in patients with cirrhosis. Two older theories about the formation of ascites are still unproven, and the overflow theory seems relevant to the various stages of the course of cirrhosis. Albumin has been used to reduce ascites formation in cirrhosis and improve circulation and kidney function. These results are supported by various research results that are only based on experience and not supported by prospective studies. The formation of ascites is generally the same as edema in other places, namely the gradient of permeability hydraulic and oncotic pressure. The occurrence of portal hypertension is the initial stage of fluid retention in liver cirrhosis. Patients

with cirrhosis without portal hypertension will not develop ascites or edema. Portal pressure > 12 mmHg is required for fluid retention to occur. On the other hand, ascites usually resolve when the portal pressure drops below 12 mmHg, for example, after surgery or a portosystemic shunt.<sup>15-17</sup>

#### 5. Conclusion

This study found that the incidence of ascites was not related to the effect on blood albumin levels.

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