Albumin Levels Can as a Predictor of the Severity of COVID-19 Severe-Critical Patients that was Taken in Isolation in Adam Malik General Hospital

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Abstract: _Background: COVID-19 is a new disease, the virus that causes COVID-19 is called SARS-CoV-2. Cytokine storms underlie the development of severe COVID-19 disease. Circulating albumin levels are related to the severity of COVID-19 infection. Albumin is a key mediator of immune dysregulation in COVID-19 patients through its immune-suppressing effects and production of pro-inflammatory cytokines that directly contribute to cytokine storm. Methods: This research is an observational study with cross sectional data collection method. This study took blood samples from 39 patients who were treated at the RSUP H. Adam Malik Medan. The sample is checked for Albumin. The research was carried out after obtaining ethical approval and informed consent. Results and Discussion: There were 22 female subjects (56.4%). There were 17 male patients (43.6%). Subjects with severe level were 28 people (71.8%) and with critical level were 11 people (28.2%). Of the 22 female subjects, there were 17 people (77.3%) with severe severity. Using weight spectrophotometry 28 people (71.8%), critically 11 people (28.2%). Albumin levels showed a median of 2.64 g/dL with the lowest level of 1.2 g/dL and the highest level of 3.8 g/dL. The Mann Whitney test showed that there was a significant relationship between albumin and the severity of COVID-19 (p > 0.001). Conclusions and Suggestions: There is a significant relationship between albumin and the severity of COVID-19. Further research needs to be done with serial examination of albumin._

Keywords: COVID-19, Albumin

1. Introduction

On December 31, 2019, the WHO China Country Office reported a case of pneumonia of unknown etiology in Wuhan City, Hubei Province, China. On January 7, 2020, China identified the pneumonia of unknown etiology as coronavirus disease (COVID-19). After infection, patients with COVID-19 may experience mild, moderate, or severe symptoms.1[, 2, 3]

Hypoalbuminemia is one of the most frequently observed laboratory abnormalities in patients with SARS-CoV-2 infection and is more prominent in severe cases than in mild-moderate cases. The mechanisms underlying hypoalbuminemia and the association with respiratory failure and clinical outcome still need to be clarified. There are mechanisms other than hepatocellular injury that explain the hypoalbuminemia seen in COVID-19 patients. One possible mechanism is the intense systemic inflammation that is reported to be severe in COVID-19.4[, 5, 6, 7]

2. Purpose

This study aims to determine albumin levels as a predictor of the severity of severe-critical COVID-19 patients who are treated in isolation at the HAM Hospital, so that they can be considered in the management of COVID-19 patients.

3. Research Methods

This research is an observational study with cross sectional data collection method. The study was conducted at the Department of Clinical Pathology, USU Medical Faculty / H. Adam Malik Hospital, Medan in collaboration with the Pulmonology Department of USU Medical Faculty / H. Adam Malik Hospital, Medan, from April to December 2021. The research subjects were patients with COVID 19 who were treated at H. Adam Malik Hospital. Medan, and has met the inclusion criteria.

The sample size in this study was determined by 39 research subjects. The inclusion criteria in this study were all adult COVID-19 patients with decreased albumin levels who were treated in hospital isolation rooms and willing to participate in the study. Exclusion criteria included patients receiving albumin substitution, mild-moderate grade patients and patients with hematological malignancies

Albumin examination was carried out at the Department of Clinical Pathology, USU Medical Faculty / H. Adam Malik Hospital, Medan using the ARCHITECT PLUS C1 4100 instrument with spectrophotometric principles.

4. Statistical Analysis

Data analysis was performed using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) software for Windows. The description of the characteristics of the research subjects is presented in tabulated form and described. Correlation between albumin levels in COVID-19 using the Pearson correlation test if the data is normally distributed. If the data is not normally distributed, Spearman's test is used. All statistical tests with p value < 0.05 were considered significant.

5. Results

There were 22 female subjects (56.4%). There were 17 male patients (43.6%). The median age of the research subjects was 58 years with the youngest age 17 years and the oldest

age 78 years. From the assessment of the severity level, it can be seen that subjects with a severe level of 28 people (71.8%) and with a critical level of 11 people (28.2%).

Table 1: Characteristics of Research Subjects

Subject Characteristics	n = 39
Gender, n (%)	
Man	17 (43, 6)
Woman	22 (56, 4)
Age (years)	58 (17-78)
COVID Severity Level, n (%)	
Heavy	28 (71, 8)
Critical	11 (28, 2)

Table 2: Characteristics of Research Subject Laboratory Examination Results

Characteristics of Research Subjects	n = 39
Albumin Level, g/dL	
Average (SD)	2, 64 (0, 56)
Median (Min – Mak)	2, 6 (1, 2 – 3, 8)

Table 3: The Relationship between Sex and the Severity of COVID-19 Disease

Gender	COVID-19 Disease Severity Level		P
	Heavy (n=28)	Critical (n =11)	
Man	11 (64, 7)	6 (35, 3)	0, 482[*]
Woman	17 (77, 3)	5 (22, 7)	

[a]Fischer's Exact

Using the Mann Whitney test showed that there was no significant relationship between gender and the severity of COVID-19 disease (p = 0.482).

Table 4: The Relationship between Albumin Levels and Severity COVID-19 disease

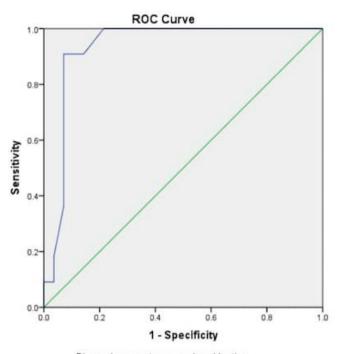| Albumin Level, g/dL	COVID-19 Disease Severity Level		P
	Heavy (n =28) (Mean±SD)	Critical (n =11) (Mean±SD)	
Average	2, 86 ± 0, 47	2, 08 ± 0, 34	<0, 001[*]

[*]Mann Whitney

Table 5: The Relationship between Albumin Levels and the Severity of COVID-19 Disease by Gender

Albumin Level, g/dL	N	COVID-19 Disease Severity Level		P
		Heavy (Mean±SD)	Critical (Mean±SD)	
Man	17			
Average		2, 94 ± 0, 36	2, 07 ± 0, 47	0, 001[*]
Woman	22			
Average		2, 81 ± 0, 53	2, 1 ± 0, 12	<0, 001**

[a]T Independent

The results of the analysis using the ROC curve (figure 1) obtained that the AUC (Area under Curve) area of albumin levels in predicting the severity of COVID 19 was 93.2% with p < 0.001 and 95% CI 84.8%-100%. This shows that albumin levels can be used to predict the severity of COVID 19 with a very good level of ability (AUC > 90%). Based on the line graph in Figure 2, the cut off value for albumin levels to predict the severity of COVID 19 is 2.35 g/dL.

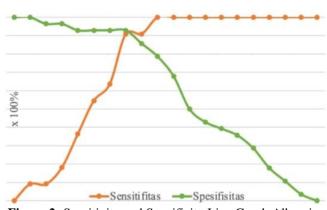**Figure 1:** ROC Curve of Albumin Level against COVID-19 Severity

Figure 2: Sensitivity and Specificity Line Graph Albumin Levels on the Severity of COVID 19

Table 6: Albumin Accuracy in Predicting the Severity of COVID 19

Yes	Severity		Sensitvity	Spesivisity	NDP	NDN	Accuracy
	Ya	No					
Albumin, g/dL							
≤2, 35	10	2	90, 9%	92, 9%	83, 3%	95, 3%	92, 3%
>2, 35	1	26					

6. Discussion

In this study, 22 female subjects (56.4%). There were 17 male patients (43.6%). The median age of the research subjects was 58 years with the youngest age 17 years and the oldest age 78 years. From the assessment of the severity level, it can be seen that subjects with a severe level of 28 people (71.8%) and with a critical level of 11 people (28.2%).

This is in line with the research conducted by Jiaofeng et al 2020. They conducted a retrospective study of 299 COVID patients, the study population was dominated by male patients as much as 53.5%, while female sex was 46.5%, age range in their study population, the youngest age > 17 years and the oldest age > 70 years.8

By using the Mann Whitney test, this study showed that there was a significant relationship between albumin levels and the severity of COVID-19 disease ($p < 0.001$).

In contrast to the study conducted by Francesco et al 2020. There was a significant difference in the rate of travel and found 64 deaths. Compared with survivors, nonsurvivors had a higher prevalence of admission to the intensive care unit (ICU), and generally these patients had elevated D-dimer levels, CRP (hs-CRP) and lower albumin values. By Cox regression analysis, albumin (hazard ratio [HR]: 0.38, 95% confidence interval [CI]: 0.23-0.63, $p < 0.001$) and age (HR: 1.03, 95% CI: 1.01–1.06, $p = 0.001$) independently associated with an increased risk of death, we led to the hypothesis that albumin analysis could be used to identify patients with a higher risk of death in COVID-19 patients, albumin levels were not only associated in contrast to overall mortality.[17]

Using the Mann Whitney test, this study showed that there was a significant relationship between albumin and the severity of COVID-19 ($p = 0.002$).

7. Conclusion

Using the Mann Whitney test, this study showed that there was a significant relationship between albumin and the severity of COVID-19 ($p = 0.002$).

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