

The correlation between albumin levels with 30 days mortality in community acquired pneumonia patients

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Abstract. The assessment of level severity of Community-Acquired Pneumonia (CAP) patient at the early admission to the hospital is critical because it will determine the severity of the disease and the subsequent management of the plan. Albumin can be used as a biomarker to assess the severity of CAP. To identify the correlation between albumin level at early admission in hospital with 30-day mortality in patients with CAP. It was a cohort study. We had examined of 50 CAP subject with the CURB-65 score (Confusion, Urea, Respiratory rate, Blood pressure, Age >65 years), albumin, sputum culture at the early admission at Emergency Room (ER). Then, albumin levels associated with 30-day mortality was assessed using Chi-Square test. Analysis with chi-square test found a significant correlation between albumin level with 30-day mortality ($p=0.001$) and Relative Risk was 2.376 (95% CI 1.515-3.723). It means that patients with CAP who has severe hypoalbuminemia have a higher risk of dying in 30 days with 2,376 times more significant than patients with mild to moderate hypoalbuminemia. In conclusion, albumin levels at early admission in the hospital correlate with 30-day mortality in CAP patients.

1. Introduction

Heart failure Community-Acquired Pneumonia (CAP) is a significant cause of morbidity and mortality throughout the world. The assessment of disease severity and outcome prediction are necessary for the adequate allocation of healthcare resources and therapeutic options in the management of CAP.[1]

A recent study has found that biomarkers like albumin correlate with severity of CAP. Viasus D, at all research, has found that low albumin levels within 24 hours of admission were independently associated with poor outcomes and had a prognostic value for predicting 30-day mortality. The inclusion of hypoalbuminemia significantly improved the prognostic performance of CAP prediction rules (PSI and CURB-65).[2,3]

This study aimed to identify the association between albumin level at early admission in the hospital with 30-day mortality in patients with CAP.

2. Methods

The study design is a cohort study. The study was in our Emergency Room (ER) and subsequently hospitalized in H. Adam Malik General Hospital Medan from December 2016 until March 2017. Inclusion criteria were CAP patients > 18 years old. Exclusion criteria were younger than 18 years, transferred from another hospital, discharged from a hospital within the previous ten days. An episode



of pneumonia within the past 30 days, active pulmonary tuberculosis, known to be positive for HIV, or chronically immunosuppressed (defined as immunosuppression for solid organ transplantation. Postsplenectomy, receiving ≥ 10 mg/d prednisolone or equivalent for more than 30 days, treatment with other immunosuppressive agents or neutropenia ($< 1.0 \times 10^9/L$ neutrophils). 50 CAP patients fulfill the criteria. Each patient was treated according to clinical conditions, and blood sampling needs for albumin, ureum and creatinine, blood culture and sputum culture. Then we check for severity of CAP with CURB-65 score (Confusion, Urea, Respiratory rate, Blood pressure, Age > 65 years). Then, albumin levels associated with 30-day mortality. The results are processed and analyzed using a computer program, with $p < 0.05$ significance. Ethical clearance was from Research Committee of Medical Field Faculty of Medicine, North Sumatera University.

3. Results

The study involved 50 CAP subject, there were nine men (18%) and 41 women (82%) with a mean age of patients was 66.28 years and mean of albumin level 2.56gr/dl, 31 subjects (62%) died and 19 live (38%) subjects. (Table 1).

Table 1. Characteristics of research subjects.

Subject Characteristics	n = 50
Sex, n (%)	
Male	9 (18)
Female	41 (82)
Age, Mean (SD), year	66.28 (8.45)
Vital sign	
Awareness	
Conscious	29 (58)
Confusion	21 (21)
SBP, mean (SD), mmHg	114.40 (22.51)
DBP, mean (SD), mmHg	70.20 (12.49)
Hearth rate, mean (SD), x/minute	99.74 (11.10)
Respiratory rate, mean (SD), x/miute	30.70 (4.95)
Temperature, mean (SD), °C	37.68 (0.82)
Laboratorium	
BUN, mean (SD), mg/dl	23.97 (39.12)
Creatinin, mean (SD), mg/dl	1 (0.61)
Albumin, mean (SD), gr/dl	2.56 (0.59)
CURB-65 score, mean (SD), n (%)	2.08 (1.24)
0	2 (4)
1	6 (8)
2	8 (16)
3	10 (20)
4	11 (22)
5	13 (26)
Blood culture, n (%)	
Positive	4 (17.39)
Negative	19 (82.6)
Sputum Culture, n (%)	
Positive	10 (50)
Negative	10 (50)
30-day mortality, n (%)	
Life	19 (38)
Death	31 (62)

SD = Standard Deviation, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure;
BUN = Blood Urea Nitrogen

The results of analysis using Spearman correlation test showed that there was a significant correlation between albumin with the CURB-65 score ($p < 0.001$) with correlation value ($r = -0.702$). The correlation value obtained means that there area strong correlation and negative value. Decreased albumin levels were followed by an increase in CURB-65 score (Table 2).

Table 2. Spearman correlation between albumin and CURB-65 score.

	Skor CURB-65	
	P	R
Albumin	<0.001	-0.702

The results showed that of 20 patients with severe hypoalbumin there were 19 people (95%) who died within 30 days. Meanwhile, of 30 patients with mild-moderate hypoalbumin levels, only 12 (40%) died. The result of the analysis by using chi-square test showed that there was a significant correlation between albumin level with 30-day death ($p = 0.001$). The RR (Relative Risk) score was 2.376 (95% CI 1.515-3.723), which means that patients with severe hypoalbumin were at risk of dying within 30 days of 2.376 times greater than patients with mild-moderate hypoalbumin levels (Table 3).

Table 3. Correlation of albumin levels with 30-days mortality.

Albumin	30-days Mortality		P	RR*
	Death (n=31)	Life (n=19)		
Severe Hypoalbuminemia	19 (95)	1 (5)	<0.001	2.376 (1.515-3.723)
Mild-moderate Hypoalbuminemia	12 (40)	18 (60)		

*Chi-Square

3. Discussion

In this study, we looked for associations of Albumin levels with CURB-65 scores when patients were admitted to hospital for 30 days of death. These findings suggest a significant relationship between albumin levels with the CURB-65 score, based on Spearman correlation with correlation value $r = -0.702$ and $p < 0.001$. The correlation value obtained means that there area high correlation and negative value. Wherein the lower albumin levels increased the CURB-65 score indicating, the higher the degree of CAP disease.

This study is an affirmation of the study of Viosus D, et al., Which concluded that patients with low albumin levels at baseline admission had severe PK severity based on CURB-65 and PSI scores with a p-value of 0.02.[3]

In this study, we looked for an association of albumin levels at the beginning of hospital admission to 30-day mortality in PK patients. The results of this study showed that of 20 patients with severe hypoalbumin there were 19 people (95%) who died within 30 days. Meanwhile, of 30 patients with mild-moderate hypoalbumin levels, only 12 (40%) died. The result of the analysis by using chi-square test showed that there was a significant correlation between albumin level with 30-day death ($p = 0.001$). The RR (Relative Risk) score was 2.376 (95% IK 1.515-3.723), meaning that patients who had severe hypoalbumin were at risk of dying within 30 days of 2.376 times greater than patients with mild-moderate hypoalbumin levels.

This study was an affirmation of the study of Viasus D et al., Which proved that low serum albumin values within 24 hours of hospital admission were independent with poor outcomes and could predict 30-day mortality in CAP patients with values ($P < 0.001$) and OR 2.11 (95% CI 1.73-2.56).

Also, the addition of hypoalbumin into PSI and CURB-65 scores significantly improved CAP prognosis performance.[3]

The mechanism underlying the high mortality rate in CAP patients can be explained based on literature that an inflammatory reaction caused by CAP-causing microorganisms. Where will the release of pro-inflammatory and anti-inflammatory cytokines such as IL-1, IL-2, IL-6, IL-10, Interferon gamma, and TNF- α . Although the production of these cytokines is important for defense functions, excessive responses have an adverse effect. In recent years, it has been mentioned that this increased inflammatory response to infection associated with a poor outcome of illness.[4,5,6] These cytokines cause endothelial barrier dysfunction resulting in capillary leakage. Capillary leakage is an important cause of hypoalbuminemia.[7,8,9]

Also, other factors also cause high mortality in CAP patients. They participated in this study that encounters other co-morbid diseases also suffered by such patients such as sepsis pneumonia, type 2 diabetes, coronary heart disease, hypertensive heart disease, Congestive heart failure, geriatric patients with immobilized conditions, decubitus ulcers, acute renal failure, anemia due to chronic disease and electrolyte disturbance. The presence of comorbidities is closely related to the high mortality of CAP patients.[10,11,12]

4. Conclusion

In conclusion, that the lower the albumin level at the beginning of admission, the higher the 30-day mortality rate in PK patients. From this study also found a significant relationship between albumin levels with a CURB-65 score in patients with community pneumonia at the beginning of admission. The lower the albumin level, the more weight the degree of CAP assessed by the CURB-65 score. Both parameters are quite easy to do in the center of health services to determine the prognosis of CAP patients from the beginning of admission.

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