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Original Research Article

Association of anemia and hypoalbuminemia with mortality among patients undergoing routine hemodialysis

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ABSTRACT

Background: The progressivity of chronic kidney disease (CKD) is associated with several clinical conditions which contribute to high morbidity and mortality, including anemia and hypoalbuminemia. This study aimed to assess the association of anemia and hypoalbuminemia with the mortality of CKD patients undergoing routine hemodialysis (HD) in Siloam Hospital Kupang.
Methods: We conducted a retrospective cohort study based on Indonesia renal registry data system and hospital medical records. We studied the following variables: gender, age, etiology of CKD, vascular access of HD, and prevalence of anemia and hypoalbuminemia. All analysis was performed using SPSS software version 22.
Results: There were 128 patients enrolled in this study. Of the total patients who died, most of them died within the first 3 months since the initiation of HD (62.1%). The majority of patients had anemia (67.2%) and hypoalbuminemia (69.5%). The bivariate analysis showed that anemia (p value=0.192), and hypoalbuminemia (p value=0.336) were not statistically significant associated with mortality among patients undergoing routine HD.
Conclusions: Anemia and hypoalbuminemia are not statistically associated with mortality outcome of CKD patients in Siloam Hospital Kupang. However, these conditions may still have prognostic importance for CKD patients undergoing routine HD. Further studies with larger size of cohort and longer period of time are warranted.

Keywords: Anemia, Hemodialysis, Hypoalbuminemia, Mortality, Chronic kidney disease

INTRODUCTION

Chronic kidney disease (CKD) is one of the most important contributors of morbidity and mortality of non-communicable disease in the world. The global burden of disease study reported that there were 697.5 million cases of CKD worldwide, and this number increased 2.5 times compared to previous year.[1,2] The progressivity of CKD due to non-optimal management is correlated with various medical complications, including hypertension, cardiovascular disease, anemia, hypoalbuminemia, bone disorders, fluid retention, acid-base disorders, electrolyte disorders, and others. This burden will affect the quality of life of CKD patients.[3]

Anemia and hypoalbuminemia are reported to be significant predictive factors for mortality in the first 3 months of hemodialysis.[4] Therefore, this study aimed to assess the association of anemia and hypoalbuminemia with the mortality of CKD patients undergoing routine hemodialysis in Siloam Hospital Kupang.

METHODS

A retrospective cohort study was conducted based on Indonesia renal registry data system and identified all patients who attended hemodialysis unit in Siloam hospital Kupang from July 2018 to April 2020. The inclusion criteria were CKD patients aged ≥19-year-old who had undergone routine hemodialysis at our hospital

from July 2018 to April 2020. Patients aged <19-year-old who were undergoing hemodialysis for the first time, patients with diagnosis of acute kidney injury, and patients whose initial laboratory data were not recorded in medical records were excluded in this study. This study was conducted in accordance with the tenets of the declaration of Helsinki.

Data collection and statistical analysis

Demographic and clinical data were retrieved from hospital medical records. Data included gender, age, etiology of CKD, vascular access of hemodialysis, and prevalence of anemia and hypoalbuminemia. All enrolled patients were divided into subgroups according to mortality outcome of patients. The numerical data were expressed as means and standard deviations. The categorical data were presented as a number and percentage. The statistical analysis was made using chi-square tests. All p values were 2-sided, and the significance level was set at 0.05. Analysis was performed using commercially available software (SPSS version 22.0).

RESULTS

The flowchart of patient selection from July 2018 to April 2020 is depicted in (Figure 1).

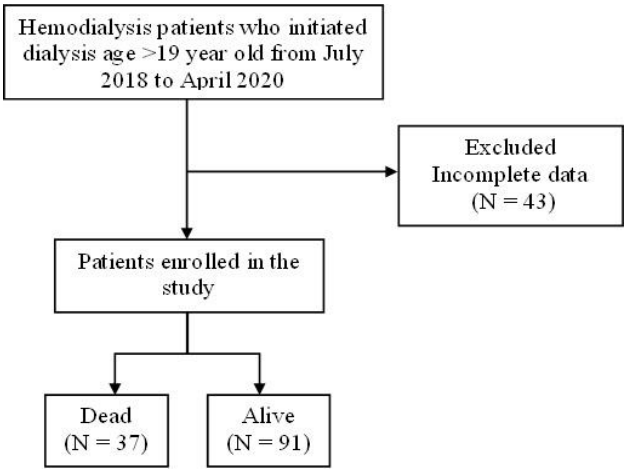

Figure 1: Patient selection.

Ultimately, from 171 patients undergoing routine hemodialysis in Siloam Hospital Kupang, 128 patients were enrolled for analysis. All patients were divided into 2 groups according to mortality outcome during the treatment. The baseline characteristics were described in (Table 1). Out of 128 patients, 53,1% of patients were male and 46.9% were female. The majority of patients were adults (64.1%) and elderly (35.9%). The etiology of CKD included the following: diabetic nephropathy (41.4%), hypertensive kidney disease (32%). obstructive nephropathy (15.6%) and others (10.9%). Regarding vascular access at dialysis initiation, 82.8% were induced through subclavian vein catheter, 7.8% through internal jugular vein catheter, 7.8% through femoral access, and 1,6% through arteriovenous fistula. At dialysis initiation, 67.2% of patients had anemia, and 69.5% of patients had hypoalbuminemia. The mean hemoglobin level was 9.125±2.22 g/dl, while the mean albumin serum level was of 3.22±0.65 g/dl. During the dialysis treatment, 37 patients (28.9%) died. The association of anemia and hypoalbuminemia with mortality is depicted in (Table 2). The bivariate analysis showed that anemia (p value=0.192; p<0.05), and hypoalbuminemia (p value=0.336; p<0.05) statistically were not associated with mortality among patients undergoing routine hemodialysis at Siloam Hospital Kupang.

Table 1: Characteristics of patients undergoing routine hemodialysis.

Characteristics	N (%)
Gender	
Male	68 (53.1)
Female	60 (46.9)
Age	
Adult	82 (64.1)
Elderly (>60-year-old)	46 (35.9)
Etiology of CKD	
Diabetic nephropathy	53 (41.4)
Hypertensive renal disease	41 (32)
Obstructive nephropathy	20 (15.6)
Others	14 (10.9)
Hemodialysis access	
Femoral	10 (7.8)
AV shunt	2 (1.6)
Subclavian vein catheter	106 (82.8)
Internal jugular vein catheter	10 (7.8)
Anemia	
Yes (Hemoglobin <10 g/dl)	86 (67.2)
No (Hemoglobin ≥10 g/dl)	42 (32.8)
Hypoalbuminemia	
Yes (Albumin <3.5 g/dl)	89 (69.5)
No (Albumin ≥3.5 g/dl)	39 (30.5)
Laboratorium value	
Hemoglobin (g/dl)	9.125±2.22
Albumin serum (g/dl)	3.22±0.65
Outcome	
Alive	91 (71.1)
Dead	37 (28.9)

Table 2: Association of anemia and hypoalbuminemia with mortality.

Parameters	Outcome		P value
	Alive (%)	Dead (%)	
Anemia			
Yes	58 (45.3)	28 (21.9)	0.192
No	33 (25.8)	9 (7)	
Hypoalbuminemia			
Yes	61 (47.7)	28 (21.9)	0.336
No	30 (23.4)	9 (7)	

DISCUSSION

In this study, out of a total of 37 respondents who died, most of them died in the first three months after initiation of HD (62.1%). Similarly, Metcalfe et al also reported the incidence of death increased in the first few weeks to the third month after the first hemodialysis and then decreased in the following months later.[5] It was generally reported that about one in eight patients died in the first 3 months after HD initiation.[6,7] Several studies observed that more than twofold increase in the risk for death and hospitalization in the first 90 days of dialysis therapy, where the most substantial risk occurred in the first 2 weeks. Overall, these first weeks of hemodialysis required close observation, because dialysis patients appeared most vulnerable during this time period.[6] The progressivity of CKD was associated with several clinical conditions which contribute to high morbidity and mortality; including anemia and hypoalbuminemia.[3] Our study showed that the majority of patients had anemia and hypoalbuminemia. In our study, the prevalence of anemia was 67.2%, with an average hemoglobin value of 9.125±2.22 g/dl, while the prevalence of hypoalbuminemia was 69.5%, with an average serum albumin value of 3.22±0.65 g/dl. We further assessed the association of anemia and hypoalbuminemia with mortality.

The Chi square test showed that anemia (p value=0.192), and hypoalbuminemia (p value=0.336) statistically were not associated with mortality among patients undergoing routine hemodialysis at Siloam Hospital Kupang. Anemia is inevitable condition found in CKD patients. This condition causes increase in mortality and morbidity, low physical ability and quality of life, as well as adding higher hospital care cost and longer hospital stay. Various causes can lead to anemia in CKD patients, including reduced erythrocyte age, uremic toxic effects, reduced production of erythropoetin, and iron deficiency.[8-10] Umami et al reported that moderate and severe anemia (Hemoglobin <8 g/dl) were significant predictors of mortality in the first three months of hemodialysis.[4] In our study, our findings differed from other studies. Our study showed that anemia was not associated with mortality of CKD patients undergoing routine HD. In contrast, study by Shrestha et al in CKD patients on regular HD showed that anemia was correlated with mortality.[11] Karaboyas et al reported that CKD patients with lower hemoglobin level was associated with a higher mortality rate in months after HD initiation, hence management of anemia before the start of dialysis improves survival after HD start, although there are many possible explanations for these findings.[12]

Hypoalbuminemia found in CKD patients is the result of decrease albumin synthesis and accumulation of albumin degradation. Changes in albumin homeostasis are induced by systemic inflammation which is associated with mortality. As a consequence, low albumin serum is a marker of chronic malnutrition and inflammation. Chronic inflammation in CKD course decreases the rate of albumin synthesis and manifest as hypoalbuminemia, hence hypoalbuminemia is a strong predictor of prognosis of CKD patients.[13,14] DOPPS study in US reported that mortality risk increases correspondingly to a decline in the serum albumin when it falls below 4.0 g/dl.[15]

In the HEMO Study, an increase in serum albumin reduced the risk of mortality for more than 6 months of follow-up in patients with albumin.[16] Similarly, Bradbury et al also mentioned that hypoalbuminemia increased the mortality risk in the first 120 days after the initiation of HD.[17] In our study, hypoalbuminemia was not statistically associated with mortality among dialysis patients. This could be because we only asses the initial albumin level when patients start the hemodialysis, not the average albumin level during the treatment. We also did not evaluate the malnutrition and inflammation status of patients, which may influence the mortality outcome of patients. However, our results may be beneficial as it highlights the role of albumin and its importance in progressivity of CKD patients undergoing routine HD.

Limitations

Our study has limitations. First, we do not have complete data regarding the hemoglobin and serum albumin level before and after HD initiation, and during the routine HD period due to lack of sufficient data in medical records. Second, this is a single center study which limits generalization, and the small size of our cohort may have compromised the study result. Therefore, we hope that future studies can be conducted with more subjects and a longer follow-up time.

CONCLUSION

Out of the total patients who died, most of them died in the first 3 months since the initiation of hemodialysis. The mortality rate is higher in patients with anemia and hypoalbuminemia. Although our study concludes anemia and hypoalbuminemia are not statistically associated with mortality outcome of CKD patients, anemia and hypoalbuminemia may still have prognostic importance for CKD patients undergoing routine HD. Further studies with larger size of cohort are required to address the association of anemia and hypoalbuminaemia with mortality in routine HD patients.

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