

Impact of Serum Albumin on Mortality of Patients on Continuous Renal Replacement Therapy

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BACKGROUND

- Albumin is the most abundant plasma protein synthesized by the liver and has several biological functions that is critical in maintaining homeostasis [1].
- Hypoalbuminemia (albumin ≤ 3.5 g/dL) at the time of admission is associated with increased in-hospital mortality, length of hospital stay, re-admissions, respiratory failure, and acute kidney injury in critically ill and non-critically ill patients [2,3].
- However, there is a paucity of information regarding the association of albumin levels on mortality after initiation of Continuous renal replacement therapy (CRRT) in patients with AKI.

OBJECTIVES

- This study aimed to assess the impact of hypoalbuminemia on mortality in critically ill patients requiring continuous renal replacement therapy (CRRT)

METHODS

- Design:** Single center, retrospective cohort study.
- Inclusion Criteria:** Adult patients admitted to the ICU from December 2006 to November 2015 who received CRRT for AKI for at least 24 hours were included.
- Exclusion Criteria:** Moribund patients who died within 24 h of CRRT initiation and patients who were unable to provide research authorization were excluded.
- CRRT:** Continuous venovenous hemofiltration was the standard CRRT modality performed in our hospital.
- Data Collection:** Clinical characteristic, treatment, and laboratory data were abstracted from hospital and ICU electronic databases. The primary predictors were serum albumin measured within ± 24 h of CRRT initiation.
- Hypoalbuminemia was defined as serum albumin of < 3.5 g/dL. The primary outcome was 90-day mortality after CRRT initiation.
- Statistics:** We used logistic regression to assess serum albumin before CRRT as predictors for 90-day mortality.

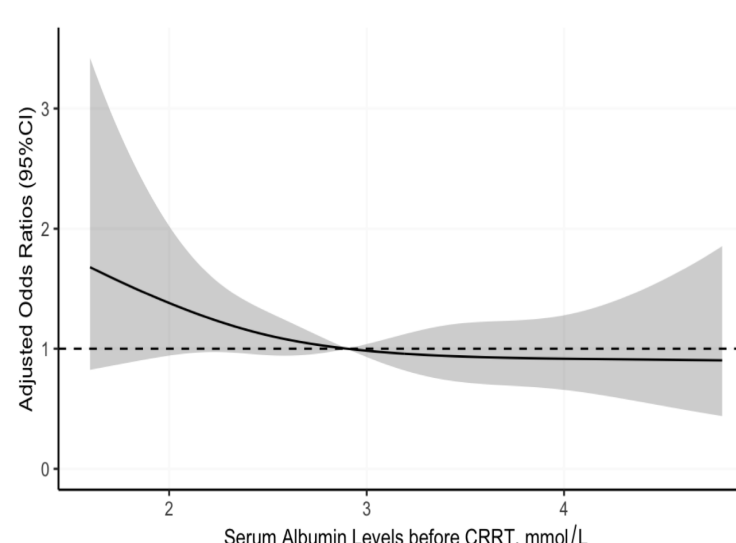
RESULTS

- Out of 1758 ICU patients who underwent CRRT during the study period, 911 eligible patients were included in the analysis.
- The mean age was 59 ± 15 years, 57% were male, and 86% were Caucasian. Twenty-six percent were admitted in medical ICU, 16% in surgical ICU, 25% in cardiac surgery ICU, 8% in cardiac ICU, and 25% in mixed ICU.
- 71% and 68% received mechanical ventilation, and vasopressors, respectively, at CRRT initiation.
- CRRT was initiated in 88% for acute kidney injury indications, whereas 12% had a history of end-stage kidney disease.
- The median duration of CRRT was 6 (IQR 4–11) days.
- The mean serum albumin at CRRT initiation was 3.0 ± 0.7 g/dL. Serum albumin levels of ≤ 2.4 , 2.5–2.9, 3.0–3.4, and ≥ 3.5 g/dL were noted in 24%, 29%, 24%, and 23% of patients, respectively.
- After adjusting for potential confounders, serum albumin ≤ 2.4 g/dL was significantly associated with higher 90-day mortality with OR of 1.57 (95% CI 1.02–2.42), compared with patients with serum albumin of ≥ 3.5 g/dL.

TABLE 1: The association between serum albumin levels at CRRT initiation and 90-day mortality

serum albumin at CRRT(g/dL)	Multivariate Analysis	
	Adjusted OR * (95% CI)	P value
≤ 2.4	1.58 (1.02-2.46)	0.04
2.5-2.9	0.98 (0.66-1.47)	0.93
3.0-3.4	1.12 (0.74-1.70)	0.59
≥ 3.5	1 (ref)	1

FIGURE 1: Restricted cubic spline of the association between serum albumin at CRRT and 90-day mortality



DISCUSSION

- This large cohort of critically ill patients requiring CRRT demonstrated higher 90-day mortality with serum albumin ≤ 2.4 g/dL compared to serum albumin ≥ 3.5 g/dL at CRRT initiation.
- In contrast, serum albumin between 2.5–2.9 g/dL and 3.0–3.4 g/dL were not significantly associated with higher mortality rates.
- Moon et al demonstrated that all-cause mortality was higher among patients who underwent CRRT for treatment of AKI with albumin < 2.5 g/dL when compared to patients with albumin 2.5–3.0 g/dL and above 3.0 g/dL [4].
- The results of our study can be explained by the impact of hypoalbuminemia on several biological functions such as regulation of intravascular volume, transport of endogenous and exogenous substances such as drugs, scavenging of reactive oxygen species.
- Hypoalbuminemia may also indicate poor nutritional status and increased inflammatory state as albumin is a negative acute phase reactant

CONCLUSIONS

- Hypoalbuminemia < 2.5 g/dL was significantly associated with an increased risk of 90-day mortality in critically ill patients requiring CRRT.
- Further studies are needed on whether correction of hypoalbuminemia in critically ill patients may improve or impact out-comes and mortality.

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