Association of Hypochloremia with Mortality among Patients Requiring Continuous Renal Replacement Therapy

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BACKGROUND

- Chloride is the most abundant anion in the extracellular fluid that plays a critical role in regulating plasma osmolarity, acid-base balance and electroneutrality in the human body [1].

- Hypochloremia and hyperchloremia have been associated with increased risk of mortality in study populations such as peritoneal dialysis patients, hospitalized patients, critically ill patients, and cardiac intensive care unit patients.

- However, there is a lack of literature on whether dyschloremia is associated with mortality after initiation of Continuous renal replacement therapy (CRRT) in patients with AKI.

OBJECTIVES

- Hence, this study aimed to assess the associations of serum chloride before and during CRRT on mortality among critically ill patients with AKI requiring 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:** Patients were excluded if they had history of end-stage kidney disease or received any dialysis modalities within 7 days before CRRT initiation, died within 24 hours of CRRT initiation and did not provide research authorization.

- **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. The normal reference range for serum chloride was 99-108 mmol/L.

- **Statistics:** We used logistic regression to assess 1) serum chloride before CRRT, and 2) mean serum chloride during CRRT as predictors for 90-day mortality after CRRT initiation.

RESULTS

- Out of 1758 ICU patients who underwent CRRT during the study period, 1282 eligible patients were included in the analysis.

- The mean age was 61±15 years, 59% (n=759) were male, and 88% (n=1,112) were Caucasian.

- 73% and 67% received mechanical ventilation, and vasopressors, respectively, at CRRT initiation.

- The median duration of CRRT was 6 (IQR 4–10) days.

- The mean serum chloride before CRRT was 103±7 mmol/L. Before CRRT, serum chloride levels of ≤98, 99-108 and ≥109 mmol/L were noted in 25% (n=324), 50% (n=644), and 25% (n=314) of patients, respectively.

- During CRRT, the mean serum chloride was 106±4 mmol/L. During CRRT, serum chloride levels of ≤98, 99-108, ≥109 mmol/L were noted in 4% (n=54), 70% (n=892), and 26% (n=336) of patients, respectively.

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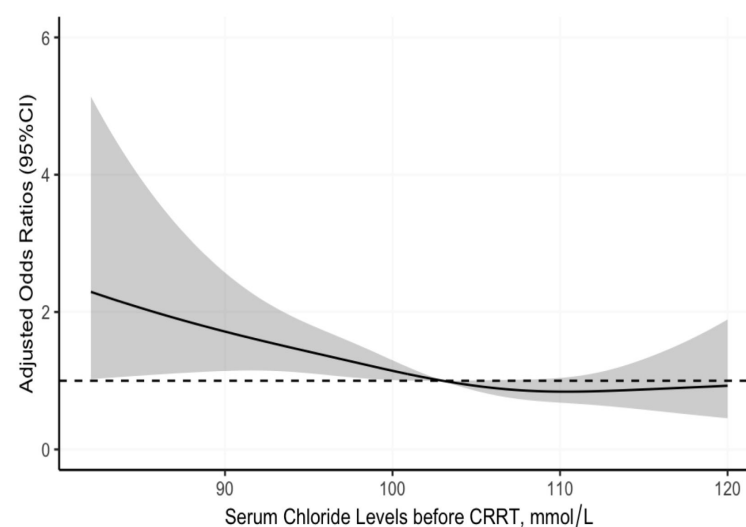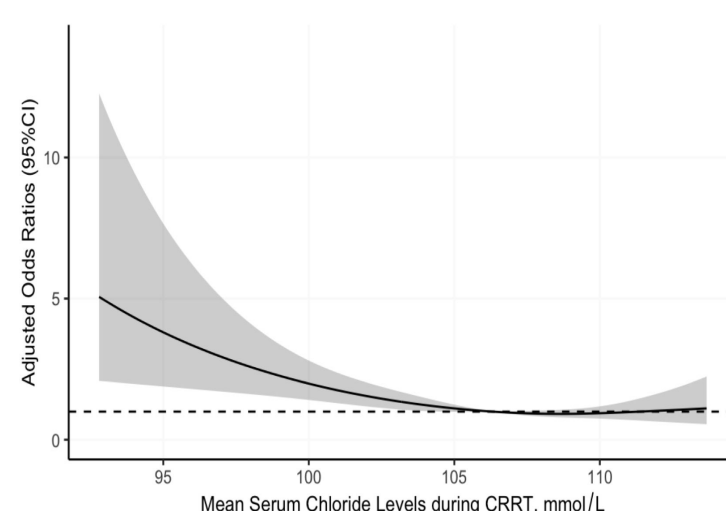

FIGURE 2: Restricted cubic spline of the association between serum chloride during CRRT and 90-day mortality

DISCUSSION

- In a large cohort of critically ill patients requiring CRRT, hypochloremia (serum chloride ≤98 mmol/L) and hyperchloremia (serum chloride ≥109 mEq/L) were found in 50% of the patient population before CRRT initiation.

- In addition, between low serum chloride (≤98 mmol/L) before and during CRRT was associated with 90-day mortality after adjusting for potential confounders in multivariate analyses.

- In contrast, serum chloride ≥109 mmol/L was not associated with mortality before and during CRRT.

- Several studies have demonstrated that hypochloremia is significantly associated with increased risk of in-hospital and 90-day mortality among patients in cardiac ICU, post operative patients with sepsis and cirrhosis in the ICU and increased risk of AKI.

- There have been conflicting reports in the literature on whether hyperchloremia is associated with an increased risk of in-hospital mortality.

CONCLUSIONS

- Hypochloremia, but not hyperchloremia, was associated with increased 90-day mortality before initiation of CRRT and during CRRT.

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