

Reassessing Chloride-rich Fluid Risks

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Keywords: Acute kidney injury, Balanced salt solution, Intensive care unit, Length of stay, Normal saline.

Indian Journal of Critical Care Medicine (2025); 10.5005/jp-journals-10071-25030

Dear Editor,

The recently published article by Gupta et al., titled “Salt-based or Balanced Solution—Trends Existing in Indian Intensive Care Units: A Multicenter Prospective Observational Cohort Study (SOLUTE Study)”, presents a rigorously conducted investigation; however, several aspects of the authors’ findings and interpretations merit critical appraisal.¹

The study reports an intensive care unit (ICU) survival rate of 63.3% in the normal saline (NS) category compared to 79.44% in the balanced salt solution (BSS) category ($p < 0.001$). The incidence of acute renal failure (ARF) was significantly increased in the NS category, chased by patients receiving Ringer’s lactate (RL) and then BSS ($p < 0.0001$). These findings, while noteworthy, require further contextualization. The authors suggest that chloride-rich solutions, particularly when administered in large quantities, may induce metabolic acidosis, thereby contributing to ARF and decreased survival.¹ However, this remains a topic of ongoing debate within the critical care community.

The theoretical basis for concern regarding NS lies primarily in its impact on acid–base homeostasis. The Stewart–Figge approach provides a mechanistic explanation for NS-induced acidosis, attributing it to a decrease in the apparent strong ion difference (SIDa) secondary to elevated chloride concentrations. According to this method, the SIDa is an independent variable that is not altered by unidirectional sodium and chloride changes, making it a more accurate detector of fluid-related hyperchloremic metabolic acidosis. Since NS has a SIDa of zero, its infusion reduces plasma SIDa, thus promoting hyperchloremic metabolic acidosis.²

Nevertheless, evidence challenging the clinical relevance of this mechanism continues to accumulate. A recent study demonstrated that a reduced SIDa, excluding lactate, was not independently associated with mortality in septic patients, thereby undermining the presumed pathogenic role of hyperchloremia.³ Furthermore, a meta-analysis involving 6,253 perioperative intensive care patients revealed only a frail relationship amidst high-chloride solution administration and increased ARF occurrence—an association that became statistically non-significant upon exclusion of heavily weighted studies.⁴ Consistent with this, a randomized trial comparing 0.9% saline and plasma-lyte® for ICU volume resuscitation could not locate differences in the occurrence of ARF, need for kidney replacement therapy (KRT), or survival between the two groups.⁵

Importantly, Gupta et al. did not report serum chloride concentrations across the study groups, leaving unanswered whether hyperchloremia was more prevalent in the NS group. Moreover, the incidence of renal replacement therapy (RRT) was comparable between the NS and BSS groups, further questioning the clinical impact of chloride load in their cohort.¹

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How to cite this article: Gillis P, Oueslati I, Errais O, Benkaddour Y, De Lissnyder N, Blackman S, et al. Reassessing Chloride-rich Fluid Risks. *Indian J Crit Care Med* 2025;29(9):793–794.

Source of support: Nil

Conflict of interest: None

In conclusion, while the SOLUTE study adds valuable data to the ongoing discussion surrounding fluid choice in critical care, its conclusions regarding the detrimental effects of chloride-rich fluids are not fully substantiated by the presented findings. Several key questions remain unresolved, and additional research is warranted before definitive clinical recommendations can be made.

AUTHORS CONTRIBUTIONS

PG and PMH designed the paper. All authors participated in drafting and reviewing. All authors read and approved the final version of the manuscript.

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