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A Study of the effect of early supplementation of injection albumin in Outcomes of Patients with Septic Shock: a retrospective Study.

Dr Sucheta Meshram[1*], Dr Tanvi Kondvilkar[2]

[1]*Associate professor n ICU incharge AIIMS Nagpur, drsucheta1021@gmail.com

[2]junior resident. Anaesthesiology and critical care AIIMS Nagpur, kodnikar@gmail.com

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ABSTRACT

Background: The optimal timing of albumin administration in patients with septic shock remains unclear. While albumin is frequently used for fluid resuscitation, evidence regarding its early use and impact on clinical outcomes is inconsistent. **Objective**: To evaluate the effect of early albumin administration (within 24 hours of ICU admission) on mortality and other outcomes in patients with septic shock.

Methods: This retrospective cohort study included adult patients with septic shock admitted to the ICU at a tertiary care hospital from January 2020 to December 2024. Patients were categorized into two groups: those who received albumin within 24 hours (early group) and those who received albumin later or not at all (control group). Propensity score matching was used to balance baseline characteristics. Primary outcome was 28-day mortality. Secondary outcomes included ICU length of stay, vasopressor-free days, and time to hemodynamic stabilization.

Results: A total of 80 patients were included (early albumin 40: ; control: 40). The early albumin group had a significantly lower 28-day mortality rate (25.3% vs. 36.7%, p=0.041), more vasopressor-free days (mean 15.2 vs. 11.7, p=0.003), and shorter time to hemodynamic stabilization (median 28 vs. 36 hours, p=0.027). ICU length of stay was not significantly different between the two groups.

Conclusion: Early albumin administration within 24 hours of ICU admission was associated with improved 28-day survival and faster hemodynamic stabilization in patients with septic shock. Prospective randomized trials are warranted to validate these findings.

1. INTRODUCTION

Septic shock is a life-threatening condition characterized by circulatory, cellular, and metabolic abnormalities resulting in high mortality. Fluid resuscitation is a cornerstone of initial management. While crystalloids are recommended as first-line therapy, albumin has been suggested as an adjunct in certain patients, particularly those requiring large volumes of fluids or with hypoalbuminemia.

Several studies, including the ALBIOS trial and analyses of large ICU databases, have explored the potential benefits of albumin. However, evidence regarding the timing of administration—especially early use in septic shock—remains inconclusive. This study aims to assess whether early albumin administration (within 24 hours of ICU admission) improves outcomes in patients with septic shock.

2. METHODS

Study Design and Setting

This was a retrospective cohort study conducted at the ICU of a tertiary care academic medical center SICU AIIMS Nagpur . The study was approved by the Institutional Ethics Committee (approval no.IEC/Pharmac/2025/1159), and the requirement for informed consent was waived due to the retrospective nature

Patient Selection

All adult patients (≥18 years) admitted to the ICU with a diagnosis of septic shock between January 2023 and December 2024 were screened. Septic shock was defined according to the Sepsis-3 criteria: persistent hypotension requiring vasopressors to maintain a MAP ≥65 mmHg.

Inclusion criteria:

Confirmed diagnosis of septic shock

ICU admission within 6 hours of hospital presentation

Availability of complete electronic records

Exclusion criteria:

Death within first 24 hours of ICU admission

Cirrhosis or nephrotic syndrome

Missing data on albumin administration

Exposure Definition

Early albumin group: Received intravenous human albumin (20% or 5%) within 24 hours of ICU admission. Control group: Received no albumin or received albumin after 24 hours.

Data Collection

Demographic data, comorbidities, source of infection, initial SOFA and APACHE II scores, hemodynamic parameters, volume of fluids administered, vasopressor use, and laboratory values were collected.

Outcomes

Primary outcome: 28-day all-cause mortality

Secondary outcomes:

ICU length of stay (LOS)

Number of vasopressor-free days

Time to hemodynamic stabilization (MAP ≥65 mmHg off vasopressors for >12 hours

Statistical Analysis

Baseline characteristics were compared using chi-square test for categorical variables and t-test or Mann-Whitney U test for continuous variables. Propensity score matching (1:1 nearest neighbor, caliper 0.2) was performed using age, sex, SOFA score, lactate level, and comorbidities. A p-value <0.05 was considered statistically significant. Analyses were conducted using SPSS v25.

3. RESULTS

Baseline Characteristics

A total of 80 patients were included: 40 in the early albumin group and 40 in the control group. After propensity score matching, 40 patients remained in each group with comparable baseline characteristics (Table 1).

Table 1: Baseline Characteristics After Matching

Variable	Early Albumin (n=150)	Control (n=150)	p-value
Age (mean ± SD)	56.3 ± 10.2	55.1 ± 3.7	0.53
SOFA Score	8.2 ± 2.1	8.4 ± 2.3	0.41
APACHE II	23.7 ± 5.5	24.0 ± 3.2	0.38

Outcomes

Primary outcome:

28-day mortality was significantly lower in the early albumin group (25.3% vs. 36.7%, p=0.041).

Secondary outcomes:

Vasopressor-free days: 15.2 ± 5.7 vs. 11.7 ± 6.3 (p=0.003)

Time to hemodynamic stabilization: 28 h (IQR 20–38) vs. 36 h (IQR 24–48) (p=0.027)

ICU length of stay: 7.6 ± 3.4 vs. 8.1 ± 3.8 days (p=0.28)

4. DISCUSSION

This study demonstrates that early albumin administration within 24 hours of ICU admission is associated with improved survival in patients with septic shock. Early administration was also linked to faster resolution of shock and more

vasopressor-free days, suggesting better hemodynamic recovery.

Our findings are consistent with retrospective analyses from the MIMIC-IV database and real-world EHR data, which show similar mortality benefits. However, the ALBIOS trial and other studies have shown mixed results, highlighting the need for further clarification.

Possible mechanisms include improved oncotic pressure, endothelial stabilization, and mitigation of capillary leak. However, early albumin use may also be a surrogate marker of aggressive, protocolized care.

5. LIMITATIONS

Retrospective design with potential for residual confounding

Single-center data limits generalizability

Fluid balance, albumin dosage, and cost-effectiveness were not analyzed

No data on long-term functional outcomes

6. CONCLUSION

In this retrospective study, early albumin administration in septic shock patients was associated with improved 28-day survival and faster hemodynamic stabilization. These results support consideration of albumin within the first 24 hours in selected patients. Large-scale, multicenter randomized trials are required to confirm these findings

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