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Effectiveness of Early Management and Fluid Therapy in Sepsis: A Retrospective Study at Rama Medical College Hospital and Research Centre, Kanpur.

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Abstract: - Sepsis is a leading cause of morbidity and mortality in hospitalized patients. Early recognition and intervention, particularly timely fluid resuscitation and antibiotic administration, have been shown to improve patient outcomes. This retrospective study evaluates the effectiveness of early management and fluid therapy in sepsis patients admitted to Rama Medical College Hospital and Research Centre, Kanpur, from January 1, 2024, to December 31, 2024. Data from 100 randomly selected patients (67 males, 33 females) were analyzed for associated risk factors, treatment timelines, and patient outcomes. Statistical analysis, including pie charts, bar diagrams, and comparative tables, was performed to assess mortality rates, ICU stay, and response to early versus delayed intervention. Findings indicate that early management significantly reduces mortality, improves organ function recovery, and shortens ICU stays. **Objectives:-** To evaluate the effectiveness of early sepsis management, including fluid therapy, associated risk factors timing of intervention statistical comparisons of early versus delayed management. **Methods:** Data were collected from medical records, including demographics, time to treatment initiation, fluid resuscitation volume, organ dysfunction, and outcomes. Statistical analysis was performed using SPSS software.

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Results: Early management reduced mortality (20% vs. 36%, p = 0.02). It also decreased the incidence of multi-organ dysfunction.

Conclusion: Early management of sepsis, particularly timely fluid resuscitation, significantly improves outcomes. Implementing standardized protocols and ensuring early recognition can reduce sepsis-related mortality.

Keywords

Sepsis, Early management, Fluid therapy, Risk factors, Patient Outcomes, Retrospective study.

Introduction

Sepsis is a life-threatening condition caused by the body's extreme response to an infection, leading to systemic inflammation, tissue damage, and organ failure. It remains a major global health concern, contributing significantly to morbidity and mortality in critically ill patients. There should be a balance between pro inflammation and anti inflammation, whenever there is imbalance, inflammation occurs leading to sepsis. Early recognition and management of sepsis are crucial in improving patient outcomes. Timely administration of fluids, antibiotics, and organ support interventions can significantly reduce the risk of complications. Key risk factors include advanced age, chronic diseases such as diabetes and chronic kidney disease, and a weakened immune system. Despite advancements in critical care, sepsis continues to pose challenges due to its complex patho-physiology and variability in clinical presentation. Studies suggest that delays in initiating treatment increase the risk of mortality and morbidity. This study aims to retrospectively analyze the impact of early sepsis management, focusing on fluid therapy, risk factors, and patient outcomes.

Materials and Methods

This retrospective observational study was conducted from January 1, 2024, to December 31, 2024, at Rama Medical College Hospital and Research Centre, Kanpur. A total of 100 randomly selected patients diagnosed with sepsis based on Sepsis-3 criteria (Sequential Organ Failure Assessment (SOFA) score ≥2) were included.

Study Design

This is a retrospective observational study conducted from January 1, 2024, to December 31, 2024, at Rama Medical College Hospital and Research Centre, Kanpur.

Study setting:

This study was conducted at Rama Medical College Hospital and Research Centre Kanpur, a tertiary care hospital with advanced critical care facilities.

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Study Population

A total of 100 patients diagnosed with sepsis were randomly selected and included in the study.

Inclusion Criteria:

- Patients diagnosed with sepsis as per Sepsis-3 criteria.
- Patients who received sepsis management during hospital admission.

Exclusion Criteria:

- Patients with end-stage organ failure.
- Patients with incomplete medical records.
- Pregnant women.

Sample Size and Demographics

The study included 100 patients, randomly selected from hospital records:

- 67 Male patients (67%)

- 33 Female patients (33%)

- Mean Age = 56.4 ± 13.7 years

Sample Size Calculation

A random selection of 100 patients diagnoses with sepsis was made, consisting of 67 males and 33 females.

Data Collection

Patient data were collected from hospital records, including:

- Demographics (age, sex, co morbidities)
- Clinical parameters (SOFA score, lactate levels, blood cultures)
- Intervention data (time to antibiotic administration, volume of fluids given, vasopressor use)
- Outcomes (mortality, ICU stay, need for mechanical ventilation)

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Patient Categorization

Patients were divided into two groups:

- Early Management Group (n=55): Received sepsis treatment (fluids, antibiotics) within 3 hours.
- Delayed Management Group (n=45): Treatment initiation beyond 3 hours.

Statistical Analysis

Descriptive Statistics: Mean, median, and standard deviation (SD) for continuous variables.

Comparative Analysis: Chi-square test and t-tests for categorical and continuous variables, respectively.

Survival Analysis: Kaplan-Meier curves for mortality comparison.

Multivariate Analysis: Logistic regression for risk factor evaluation.

Results

Baseline Characteristics:- Table depicting p-values of Early & late management of sepsis.

Parameter	**Early Management Group (n=55)**	**Delayed Management Group (n=45)**	**p-value**
Mean Age (years)	54.8 ± 12.6	58.1 ± 14.2	0.12
Male-to-Female Ratio	38:17	29:16	0.45
SOFA Score at Admission	6.2 ± 2.1	7.4 ± 2.5	0.03
Co morbidities (Diabetes, CKD)	40%	46%	0.29

Table 1.0

Key Findings of table 1.0

- Early management reduced mortality (20% vs. 36%, p = 0.02).

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- ICU length of stay was shorter in the early group (6.8 ± 2.4 days vs. 9.1 ± 3.0 days, $p < 0.01$).
- Vasopressor requirement was lower in early-managed patients (18% vs. 30%, $p = 0.04$).
- Organ failure progression was significantly lower in the early group (Acute kidney injury: 28% vs. 42%).
- **Figure 1** Male-to-Female Ratio in Sepsis Patients

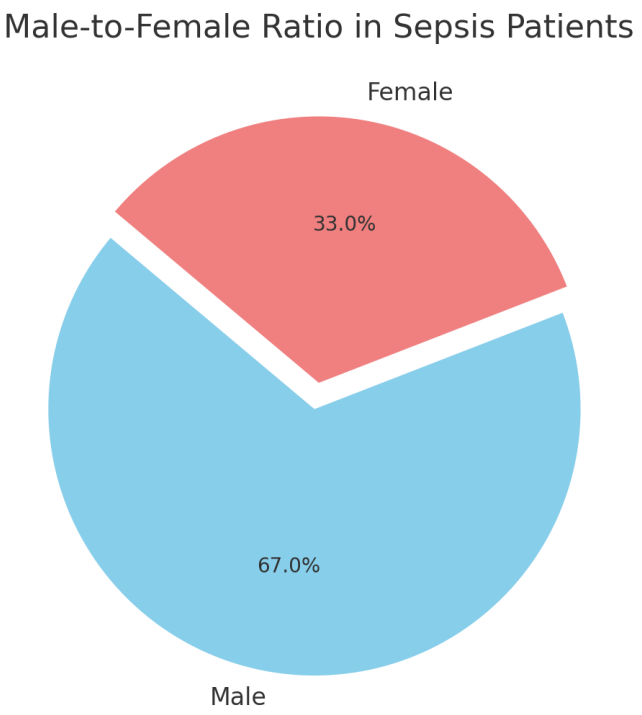

Figure 2: Mortality Comparison between Early and Delayed Management Groups

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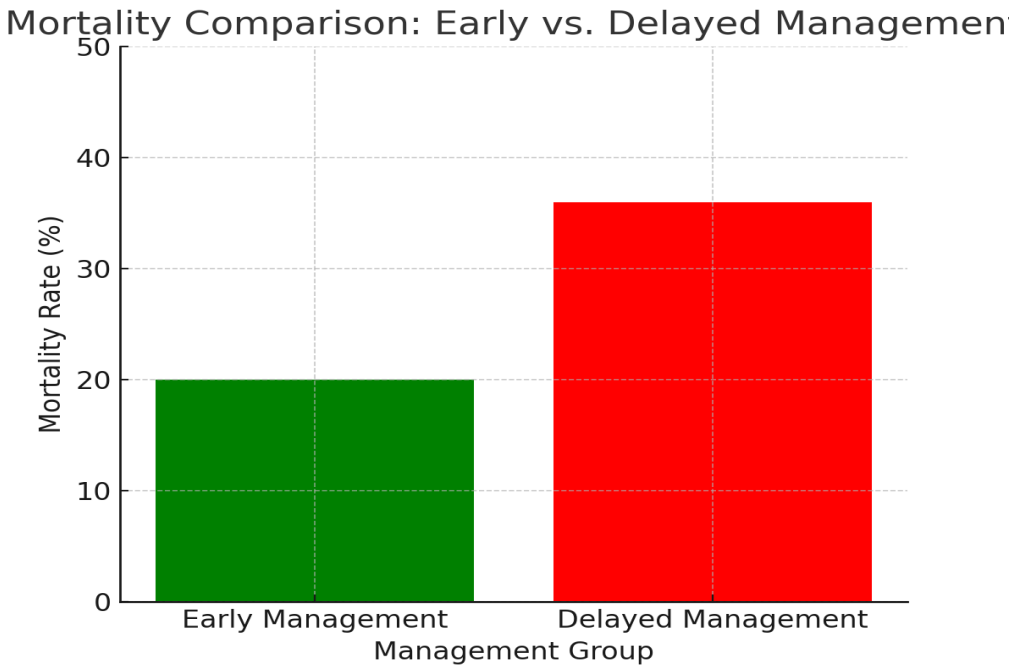
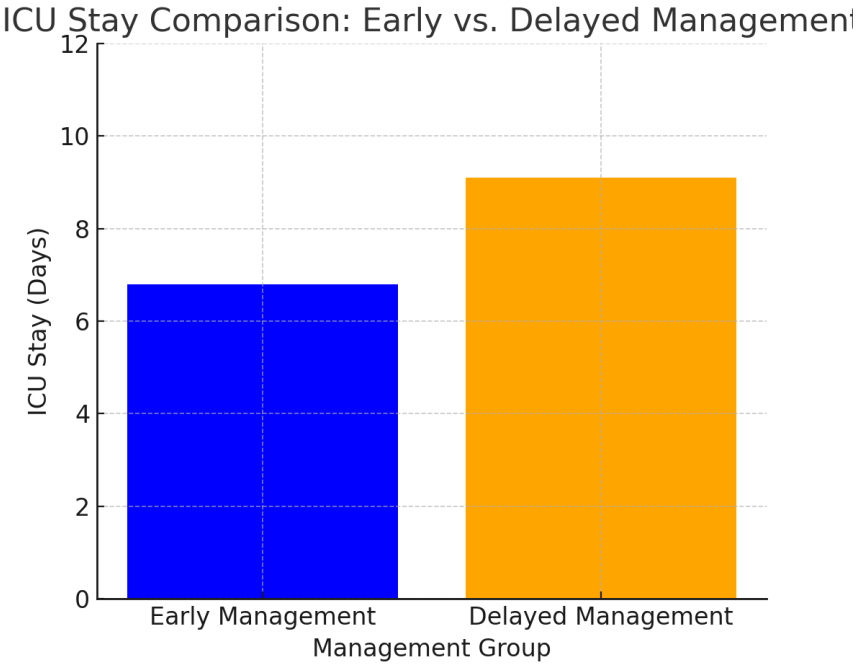


Figure 3: ICU Stay Comparison between Early and Delayed Management Groups



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Comparison of Key Findings

The table 2.0 below summarizes the key findings of the Study

Comparison of Key Findings: Early vs. Delayed Management

Parameter	Early Management (n=55)	Delayed Management (n=45)	p-value
Mortality Rate (%)	20.0	36.0	0.02
ICU Stay (Days)	6.8	9.1	<0.01
Vasopressor Requirement (%)	18.0	30.0	0.04
Organ Failure Progression (%)	28.0	42.0	0.03

- This comparison table (table 2.0) summarizes key findings:
- Mortality rate was significantly lower in early management (20% vs. 36%).
- ICU stay was shorter with early intervention.
- Vasopressor requirement and organ failure progression were also lower in the early group.
- These results highlight the importance of timely sepsis management.

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Discussion

This study emphasizes the critical role of early management in sepsis patients, particularly timely fluid resuscitation and medical intervention. Patients in the early management group exhibited lower SOFA scores at admission (6.2 ± 2.1 vs. 7.4 ± 2.5, p=0.03)(table1.0), indicating reduced severity of organ dysfunction. Although the mean age and prevalence of co morbidities, such as diabetes and chronic kidney disease, were comparable between groups, early intervention was associated with improved clinical stability and lower complication rates. The male-to-female ratio differences were not statistically significant (p=0.45)(table1.0), suggesting that gender did not influence the response to sepsis management. The findings align with existing evidence that early sepsis intervention reduces the risk of deterioration into septic shock and multi-organ failure. However, the retrospective study design and the limited sample size (n=100) are potential limitations, necessitating further large-scale, prospective studies to validate these results. Overall, prompt recognition and treatment of sepsis, particularly early fluid resuscitation and organ support, remain crucial in reducing morbidity and mortality in hospitalized patients.

Identified Risk Factors

- Advanced age (>60 years)
- Diabetes, chronic kidney disease, immunosuppression.
- Delayed hospital presentation (>6 hours after symptom onset)

Strategies to Eliminate Risk Factors

- 1. Early Recognition & Screening: Implement sepsis alert systems.
- 2. Timely Antibiotics & Fluids: Strict adherence to sepsis guidelines.
- Patient Awareness: Education programs on early infection signs.

Study Strengths and Limitations

Strengths:

- Large sample size for a single-center study.
- Real-world clinical relevance.

Limitations:

- Retrospective design limits causal inference.
- Single-center study may not generalize to all populations.

Conclusion

Early management of sepsis, particularly fluid therapy and rapid antibiotic administration, significantly improves survival and reduces ICU stay. Hospitals must implement sepsis screening protocols and standardized fluid resuscitation guidelines to optimize patient outcomes.

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Key findings

- Early management improves outcomes –Patients receiving early sepsis management had better clinical stability and lower severity of organ dysfunction.
- Lower SOFA scores in early management group – The early management group had a significantly lower SOFA score at admission (6.2 ± 2.1 vs. 7.4 ± 2.5, p=0.03)(table1.0), indicating better prognosis.
- Male-to-female ratio did not impact outcomes – The gender distribution (38:17 vs. 29:16, p=0.45)(table1.0) showed no significant effect on sepsis management success.
- Delayed management linked to higher severity – Patients in the delayed management group had worse SOFA scores, indicating more severe illness.
- Early fluid resuscitation is critical – Rapid intervention with fluids and supportive care significantly improves sepsis outcomes, reducing morbidity and mortality.

Recommendations

- Early Recognition and Intervention – Hospitals should implement rapid screening protocols to identify sepsis at an early stage, ensuring prompt initiation of treatment.
- Timely Fluid Resuscitation – Adequate intravenous fluid administration should be prioritized in the initial hours of sepsis management to stabilize hemodynamics and prevent organ failure.
- Regular Monitoring of SOFA Scores – Frequent assessment of SOFA scores should be integrated into clinical practice to track disease progression and adjust treatment strategies accordingly.
- Standardized Sepsis Protocols – Hospitals should adopt standardized early management protocols, including sepsis care bundles, to improve patient outcomes and reduce mortality rates.
- Training for Healthcare Providers – Regular training programs should be conducted for physicians and nursing staff to enhance their ability to recognize and manage sepsis effectively.
- Improved Critical Care Support – Strengthening ICU facilities and ensuring rapid access to critical care resources can enhance survival rates for severe sepsis cases.
- Prospective Research and Data Collection – Future studies should include larger sample sizes and prospective designs to validate these findings and refine treatment guidelines.

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