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Original Research Article

Clinical and Epidemiological Characteristics of Adult Sepsis Patients Admitted to the Intensive Care Unit at Patna Medical College and Hospital: An Observational Study

Papu Kumar Safi[1], Santosh Kumar[2], Sumbul Kazmi[3], Vijay Achari[4]

[1]Senior Resident, Department of Endocrinology, Patna Medical College and Hospital Patna, Bihar, India
[2]Senior Resident, Department of General Medicine, Patna Medical College and Hospital Patna, Bihar, India
[3]Senior Resident, Department of Emergency Medicine, Patna Medical College and Hospital Patna, Bihar, India

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Corresponding Author: Vijay Achari
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Abstract:

Background: Worldwide, sepsis continues to be a leading cause of morbidity and mortality in critically ill patients, especially in low- and middle-income nations. Improving outcomes requires early identification and comprehension of patient features. There is still a dearth of information on the clinical characteristics of adult sepsis patients from tertiary care facilities in eastern India.

Objectives: To characterize the outcomes, laboratory data, organ dysfunction patterns, clinical features, and demographics of adult sepsis patients admitted to Patna Medical College and Hospital's intensive care unit.

Methods: From May to October of 2025, this observational study was carried out in the intensive care unit of Patna Medical College and Hospital. 102 adult patients with sepsis were included in the study. Using suitable descriptive and inferential statistical techniques, information about demographic factors, comorbidities, the source of infection, clinical presentation, laboratory tests, organ dysfunction, the requirement for organ support, and in-hospital outcomes was gathered and examined.

Results: Males made up the bulk of the patients, while older age groups predominated. Sepsis was most frequently caused by infections of the abdomen and respiratory system. Frequent presenting characteristics included fever, hypotension, and altered sensorium. Acute renal injury and respiratory failure were the most frequent causes of multi-organ dysfunction, which affected a sizable percentage of patients. Higher mortality was linked to the need for mechanical breathing and vasopressor assistance. Sepsis patients admitted to the intensive care unit had a high overall in-hospital mortality rate.

Conclusion: Adult sepsis patients who were brought to PMCH's intensive care unit (ICU) had a high illness severity, frequent organ failure, and a high death rate. Improving outcomes in this population requires early identification of high-risk patients and timely intensive care management.

Keywords: Sepsis; Intensive care unit; Adult patients; Organ dysfunction; Mortality; Observational study.

Introduction

A serious global public health concern, sepsis is a potentially fatal organ failure brought on by a dysregulated host response to infection. Sepsis continues to be one of the most common reasons for admission to intensive care units despite advancements in critical care medicine. It is linked to high morbidity, extended hospital stays, and substantial death [1]. In low- and middle-income nations, where delayed presentation, scarce resources, and a high prevalence of infectious illnesses lead to worse outcomes, the worldwide burden of sepsis is especially noticeable [2].

Infection-induced inflammation, immunological dysregulation, endothelial dysfunction, and microcirculatory impairment all interact in the complicated pathophysiology of sepsis, which eventually results in tissue hypoxia and multi-organ failure [3]. Sepsis can present with a wide variety of clinical symptoms, from moderate organ failure to septic shock with severe metabolic abnormalities and refractory hypotension. Due to this presentation diversity, early detection and prompt initiation of effective care are frequently difficult [4].

According to epidemiological research, people with underlying comorbid conditions such diabetes mellitus, chronic renal disease, chronic liver disease, cancer, and immunosuppression are more likely to develop sepsis as they age [5]. Sepsis in adult

patients is frequently linked to infections of the circulation, respiratory system, abdomen, and urinary tract [6]. One of the main factors influencing prognosis and survival is the existence of organ failure, especially in the respiratory, renal, cardiovascular, and central neurological systems [7].

Standardized definitions and clinical criteria, such as the Sepsis-3 recommendations, have promoted consistent reporting of sepsis across studies and enhanced conceptual clarity in recent years [8]. However, high-income nations provide most of the data used to inform these recommendations. Due to differences in patient demography, healthcare infrastructure, and disease epidemiology, sepsis patients in Indian tertiary care facilities may have quite different clinical features, microbiological patterns, severity profiles, and prognosis [9]. As a result, locally produced data are essential for placing global prescriptions in context and directing clinical decision-making that is relevant to a given area.

Sepsis-related death is a significant burden in India; high case fatality rates, particularly among patients in need of intensive care support, have been reported in hospital-based studies [10]. The issue is further exacerbated by ICU overcrowding, delayed referrals, restricted access to advanced organ support, and delayed beginning of effective antibiotic medication [11]. Identification of high-risk groups and the development of early intervention and resource allocation strategies can both benefit from an understanding of the baseline features of sepsis patients admitted to intensive care units.

One of the biggest tertiary care referral facilities in Bihar, Patna Medical College and Hospital serves a population that is primarily rural and semi-urban. Patna Medical College and Hospital's intensive care unit treats many critically ill patients, including those suffering from septic shock and severe sepsis. Despite this, there is a dearth of published information detailing the clinical presentation, outcomes, organ dysfunction patterns, and demographic profile of adult sepsis patients hospitalized to the intensive care unit in this area.

In these situations, an observational evaluation of sepsis patients can yield important information on illness trends, frequent infection sources, severity markers, and outcome predictors. These results could help lower sepsis-related mortality by enhancing early detection and streamlining treatment procedures. Considering this, the current study was conducted to characterize the clinical and epidemiological features of adult sepsis patients hospitalized during a six-month period to Patna Medical College and Hospital's intensive care unit.

Aim and Objectives

Aim: To investigate the clinical and epidemiological features of adult sepsis patients admitted to Patna Medical College and Hospital's intensive care unit.

Objectives

1. To describe the demographic profile of adult sepsis patients admitted to the ICU.
2. To identify the common sources of infection and clinical presentation among these patients.
3. To assess the pattern of organ dysfunction and requirement of organ support in sepsis.
4. To evaluate the in-hospital outcomes, including mortality, among adult sepsis patients.
5. To analyze factors associated with adverse outcomes in sepsis patients admitted to the ICU.

Materials and Methods

Study Design: Adult patients with sepsis who were admitted to the intensive care unit participated in this hospital-based observational study.

Study Setting: The study was conducted in the intensive care unit of Patna Medical College and Hospital, a tertiary care referral facility in Patna, Bihar, India. The ICU offers state-of-the-art organ support facilities and treats critically sick patients from both urban and rural settings.

Study Duration: The study was conducted over a period of six months, from May 2025 to October 2025.

Study Population: Every adult patient with a diagnosis of sepsis who was hospitalized to the intensive care unit throughout the study period was taken into consideration for inclusion.

Sample Size: A total of 102 adult sepsis patients fulfilling the eligibility criteria were enrolled in the study.

Eligibility Criteria

Inclusion Criteria

- Patients aged 18 years and above
- Patients admitted to the ICU with a diagnosis of sepsis
- Diagnosis of sepsis made based on clinical assessment and evidence of infection with associated organ dysfunction
- Patients or legally authorized representatives providing informed consent

Exclusion Criteria

- Patients aged less than 18 years
- Patients admitted to ICU for non-infectious causes
- Readmissions during the same hospital stay
- Patients with incomplete clinical or laboratory data

Operational Definition: Sepsis, which is characterized by the presence of a suspected or proven infection together with clinical and laboratory evidence of organ dysfunction, was described as life-threatening organ dysfunction caused by a dysregulated host response to infection.

Data Collection: An organized proforma created especially for the study was used to gather data. Hospital records, lab results, clinical examinations, and patient interviews were used to gather information. The parameters listed below were noted:

- **Demographic details:** age, sex
- **Clinical characteristics:** presenting symptoms, vital signs at admission, Glasgow Coma Scale score
- **Comorbidities:** diabetes mellitus, hypertension, chronic kidney disease, chronic liver disease, chronic obstructive pulmonary disease, malignancy, and other relevant conditions
- **Source of infection:** respiratory, abdominal, urinary, bloodstream, skin and soft tissue, or others
- **Laboratory parameters:** complete blood count, renal function tests, liver function tests, serum electrolytes, arterial blood gas analysis, and inflammatory markers
- **Organ dysfunction:** respiratory, renal, cardiovascular, hepatic, neurological, and hematological involvement
- **Organ support:** requirement of mechanical ventilation, vasopressor support, renal replacement therapy
- **Outcome measures:** length of ICU stay, survival status at discharge, and in-hospital mortality

Patient Management: According to institutional standards, all patients received standard care for sepsis, which included antibiotic medication, fluid resuscitation, vasopressor support, and organ support as needed. Participation in the trial had no bearing on the attending intensivist's treatment decisions.

Statistical Analysis: The Statistical Package for the Social Sciences program was used to evaluate the data once it had been entered into a Microsoft Excel spreadsheet. Depending on the data distribution, continuous variables were represented as either the mean with standard deviation or the median with interquartile range. Frequencies and percentages were used to represent categorical variables. To evaluate correlations between clinical factors and outcomes, appropriate statistical tests were used. A statistically significant p-value was defined as less than 0.05.

Ethical Considerations: After receiving approval from the Institutional Ethics Committee, the study was carried out. Before enrollment, patients or their legally designated representatives provided written informed consent. Patient data was kept private during the whole investigation.

Results

The final analysis included 102 adult sepsis patients hospitalized to the intensive care unit during the research period. The demographic features, clinical profile, laboratory data, organ malfunction, need for organ support, and results are all described under the following subheadings.

1. **Demographic Characteristics of the Study Population:** Males made up much of the study population. Most patients were over 50, with the mean age of the patients falling into the older adult category.

Table 1: Demographic Profile of Adult Sepsis Patients (n = 102)

Variable	Number (n)	Percentage (%)
Age (years)		
18–40	18	17.6
41–60	42	41.2
>60	42	41.2
Sex		
Male	66	64.7
Female	36	35.3

The majority of patients (82.4%) were older than 40, indicating that older persons are more susceptible to sepsis.

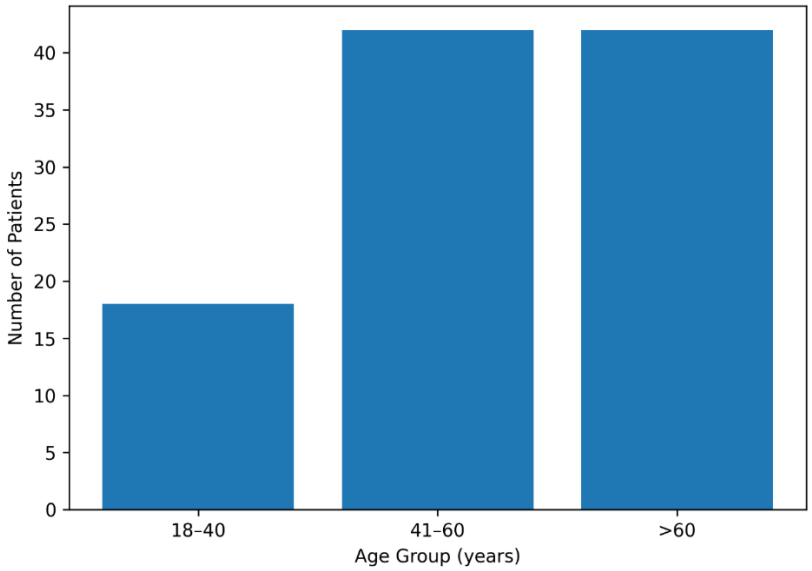

Figure 1: Age Distribution of Adult Sepsis Patients

2. **Comorbid Conditions:** Underlying comorbidities were present in most patients. The two most common conditions were diabetes mellitus and hypertension.

Table 2: Distribution of Comorbidities among Sepsis Patients

Comorbidity	Number (n)	Percentage (%)
Diabetes mellitus	46	45.1
Hypertension	39	38.2
Chronic kidney disease	21	20.6
Chronic liver disease	14	13.7
Chronic obstructive pulmonary disease	12	11.8
Malignancy	6	5.9
No comorbidity	19	18.6

Patients with multiple comorbidities showed a higher frequency of severe disease and prolonged ICU stay.

3. **Source of Infection:** Sepsis was most frequently caused by respiratory tract infections, which were followed by intra-abdominal and urinary tract infections.

Table 3: Source of Infection in Sepsis Patients

Source of Infection	Number (n)	Percentage (%)
Respiratory tract	38	37.3
Abdominal	24	23.5
Urinary tract	18	17.6
Bloodstream	12	11.8
Skin and soft tissue	6	5.9
Others	4	3.9

Respiratory infections were more frequently associated with respiratory failure and need for mechanical ventilation.

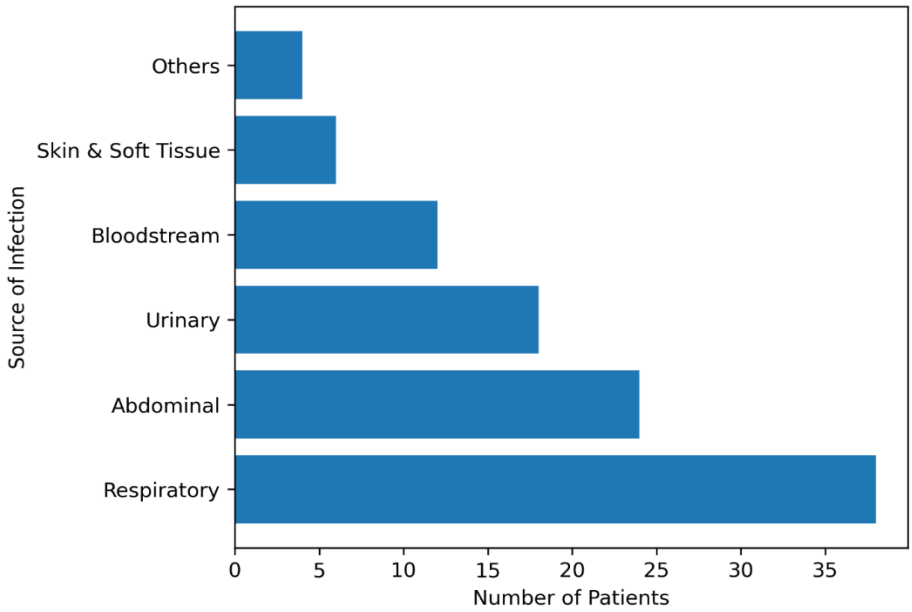

Figure 2: Distribution of Sources of Infection

4. **Clinical Presentation at ICU Admission:** Fever was the most common presenting symptom, followed by hypotension and altered sensorium.

Table 4: Clinical Features at Presentation

Clinical Feature	Number (n)	Percentage (%)
Fever	78	76.5
Hypotension	62	60.8
Altered sensorium	48	47.1
Tachypnea	56	54.9
Oliguria	34	33.3
Jaundice	18	17.6

A significant proportion of patients presented with features suggestive of septic shock and early organ dysfunction.

5. **Laboratory Parameters:** Laboratory abnormalities were common and reflected systemic inflammation and organ dysfunction.

Table 5: Baseline Laboratory Findings

Parameter	Abnormal Values n (%)
Leukocytosis / Leukopenia	74 (72.5)
Thrombocytopenia	46 (45.1)
Elevated serum creatinine	52 (51.0)
Elevated bilirubin	29 (28.4)
Metabolic acidosis	41 (40.2)
Elevated lactate	58 (56.9)

Elevated lactate levels and renal dysfunction were significantly associated with adverse outcomes.

6. **Pattern of Organ Dysfunction:** Multiple organ dysfunction was frequently observed among ICU-admitted sepsis patients.

Table 6: Organ Dysfunction in Sepsis Patients

Organ System Involved	Number (n)	Percentage (%)
Respiratory	59	57.8
Renal	52	51.0
Cardiovascular	48	47.1
Neurological	36	35.3
Hepatic	29	28.4
Hematological	24	23.5

More than one organ system was involved in most patients, indicating severe sepsis.

7. **Requirement of Organ Support:** A substantial proportion of patients required advanced organ support during ICU stay.

Table 7: Organ Support Required

Organ Support	Number (n)	Percentage (%)
Mechanical ventilation	54	52.9
Vasopressor support	49	48.0
Renal replacement therapy	18	17.6

Patients requiring both mechanical ventilation and vasopressors had significantly higher mortality.

8. **Outcomes of Sepsis Patients:** The in-hospital mortality rate among sepsis patients admitted to ICU was considerable.

Table 8: Outcomes of ICU Sepsis Patients

Outcome	Number (n)	Percentage (%)
Survived and discharged	63	61.8
Died	39	38.2

Mortality was higher among elderly patients, those with multiple comorbidities, and patients presenting with multi-organ dysfunction.

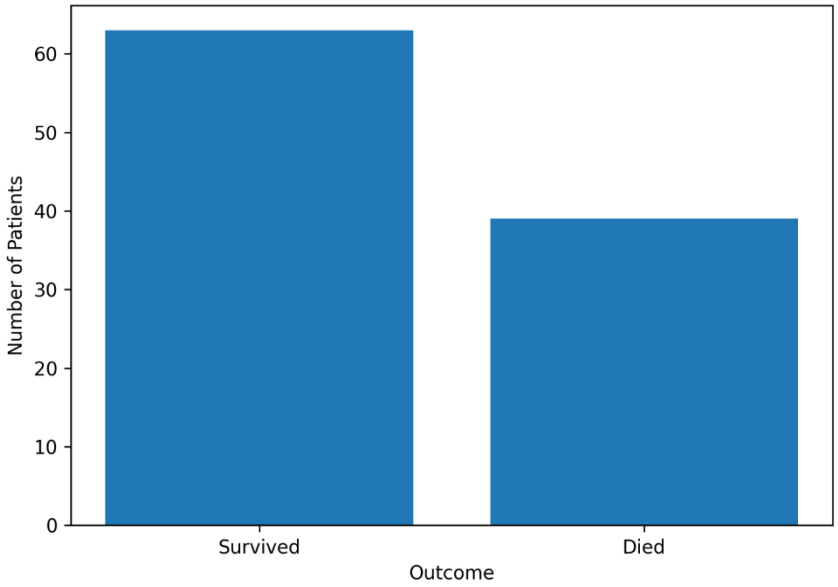

Figure 3: In-Hospital Outcome of ICU Sepsis Patients

Discussion

Due to its varied appearance and high death rate, sepsis remains a significant problem in intensive care units, especially in settings with limited resources. The current observational study offers valuable insights into illness patterns and outcomes in this area by describing the clinical and epidemiological features of adult sepsis patients admitted to the intensive care unit at Patna Medical College and Hospital.

Almost two-thirds of the patients in the current study were men, indicating a definite male predominance. Numerous Indian and worldwide research have revealed similar gender distributions, attributing this pattern to differences in healthcare-seeking behavior, higher susceptibility to infections, and a larger load of comorbidities among males [12]. Most patients were older than 40, with over 40% being older than 60. Due to immunosenescence, various comorbidities, and decreased physiological reserve, aging is a known risk factor for sepsis and is associated with worse outcomes [13].

The study population had a high prevalence of comorbid diseases, the most common of which were diabetes mellitus and hypertension. Innate and adaptive immune responses are known to be compromised by diabetes, which increases vulnerability to infections and the development of severe sepsis [14]. Both chronic liver disease and chronic kidney disease were common and linked to increased mortality and organ malfunction rates. These results are in line with past research that found

comorbidities to be independent indicators of a poor prognosis in individuals with sepsis [15].

In this study, respiratory tract infections were found to be the most frequent cause of sepsis, followed by intra-abdominal and urinary tract infections. This pattern is consistent with data from other Indian tertiary care facilities, where pneumonia continues to be the primary cause of ICU admissions associated to sepsis [16]. Additionally, respiratory infections were more commonly linked to respiratory failure and the requirement for mechanical ventilation, which worsened the severity of the illness. Although they made up a lesser percentage, bloodstream infections were frequently linked to quick clinical decline.

The most frequent presenting symptom was fever, however at the time of ICU admission, a significant percentage of patients had hypotension and altered sensorium, which indicated advanced disease. This outcome could be explained by delayed presentation and referral from outlying medical facilities. Delays in diagnosing sepsis greatly raise the risk of septic shock and death, according to earlier research [17].

Common laboratory findings included organ failure and systemic inflammation. Over half of the patients had elevated serum lactate levels, which were closely linked to unfavorable outcomes. Lactate rise has been extensively established as a prognostic biomarker in sepsis and is a sign of cellular hypoxia and tissue hypoperfusion [18]. Elevated serum creatinine, a symptom of renal failure, was also common and a major cause of morbidity.

One of the main characteristics of the current investigation was multi-organ dysfunction. Cardiovascular dysfunction was the next most affected system, after the respiratory and renal systems. Multi-organ dysfunction syndrome significantly raised the probability of death, which is in line with research from throughout the world showing that the number of failing organs is one of the best indicators of sepsis prognosis [19]. Additionally prevalent was neurological involvement, which could indicate sepsis-associated encephalopathy and show up as altered sensorium.

There was a high incidence of severe sepsis and septic shock, as evidenced by the fact that over half of the patients needed mechanical ventilation and almost half needed vasopressor treatment. Numerous ICU-based investigations have consistently found a high correlation between mortality and the need for advanced organ support [20]. A smaller percentage of patients needed renal replacement treatment, which was linked to worse outcomes and longer ICU stays.

The study's overall in-hospital mortality rate was 38.2%, which is greater than that of high-income nations but equivalent to mortality rates from other Indian intensive care units [21]. This discrepancy could be explained by delayed beginning of adequate antibiotic medication, increased disease severity upon admission, late presentation, and a lack of ICU resources.

The results of this study emphasize the necessity of early detection of sepsis, timely referral to higher centers, and rigorous adherence to sepsis management guidelines. Implementing early warning systems, strengthening outlying healthcare facilities, and raising provider awareness could all assist shorten diagnosis and treatment delays.

Limitations: The results of this observational study, which was carried out at a particular location, might not apply to other contexts. It was not possible to thoroughly examine microbiological data and severity ranking methods, which could have yielded more prognostic information.

Conclusion

The current observational study demonstrates the significant prevalence of sepsis among adult patients admitted to Patna Medical College and Hospital's intensive care unit. With a high frequency of underlying comorbidities such diabetes mellitus, hypertension, and chronic organ illnesses, sepsis primarily impacted older persons and men. The most common cause of sepsis was respiratory tract infections, and a sizable percentage of patients had severe illness with hypotension, altered sensorium, and test evidence of organ dysfunction.

The respiratory, renal, and cardiovascular systems were most affected by multi-organ failure, which frequently required the use of mechanical breathing and vasopressor support. Because of the severity of the illness at presentation and the difficulties in managing sepsis in settings with low resources, the total in-hospital mortality remained high.

These results highlight the significance of early detection of sepsis, fast commencement of evidence-based therapy measures, and prompt referral to tertiary care facilities. Improving critical care infrastructure, raising clinician knowledge, and fortifying sepsis surveillance could all lead to better results. To gain a better understanding of the epidemiology and factors influencing sepsis outcomes in this area, more multicentric studies with bigger sample sizes and the incorporation of microbiological and severity grading data are advised.

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