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***Original Research Article***

# ASSESSMENT OF THE OUTCOME OF SEPSIS PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT

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## ABSTRACT

***Background:*** *Sepsis remains a significant challenge in critical care medicine, with high morbidity and mortality rates, particularly among patients admitted to the intensive care unit (ICU). Understanding sepsis outcomes in the ICU is crucial for guiding clinical management decisions and improving patient care practices.* ***Objective:*** *This study aimed to assess the consequences of severe sepsis and septic shock in patients admitted to the ICU at Bahria Town International Hospital Lahore, focusing on mortality rates, risk factors for death, and site of infection.* ***Study Design:*** *A prospective clinical study adhering to STROBE guidelines was conducted at the ICU of Bahria Town International Hospital Lahore from March 2023 to December 2023.* ***Setting:*** *The study was conducted at the Intensive Care Unit (ICU) of Bahria Town International Hospital Lahore.* ***Duration of Study:*** *The study was conducted from March 2023 to December 2023.* ***Material and Methods:*** *Patients aged 18 years and older admitted to the ICU with severe sepsis or septic shock were included. Exclusion criteria included ICU length of stay shorter than 24 hours and patients under 18 years old. Data on demographics, infection source, comorbidities, laboratory results, hospital stay, and outcomes were prospectively collected using a predefined form. Data analysis was performed using SPSS 21 software, including descriptive statistics and binary logistic regression, to identify variables affecting patient survival.* ***Results:*** *Sixty individuals were enrolled, with a mean age of 55.55 ± 20.32 years. The majority were male (58.3%). The mean length of hospital stay was 6.43 ± 3.54 days. Among the study population, 43.3% had severe sepsis, and 56.6% had septic shock. The mortality rate was 41.6%. Positive blood culture was associated with a higher mortality rate, and patients with septic shock had a significantly increased risk of death. Complications with the respiratory, renal, and central neurological systems also increased the likelihood of death.* ***Conclusion:*** *This study highlights the significant mortality associated with severe sepsis and septic shock in ICU patients. Positive blood culture and septic shock were identified as important predictors of mortality. Early recognition and management of these factors are essential for improving patient outcomes in sepsis.*

**Keywords:** Sepsis, Septic Shock, Intensive Care Unit, Mortality, Risk Factors, Blood Culture, Outcome Assessment, Respiratory Complications, Renal Complications, Neurological Complications

## INTRODUCTION

One of the most prevalent yet underdiagnosed diseases in both the developed and underdeveloped worlds is sepsis (1). Despite advancements in medicine, it remains the leading cause of infection-related deaths and has long-term consequences (2). More people die from sepsis than from HIV/AIDS, breast cancer, and prostate cancer combined (3). Sepsis remains a significant challenge in critical care medicine, posing a considerable burden on healthcare systems worldwide (4). Defined as a dysregulated host response to infection leading to organ dysfunction, sepsis is associated with high morbidity and mortality rates (5), particularly among patients admitted to the intensive care unit (ICU). Despite advances in medical care, sepsis continues to be a leading cause of death in critically ill patients (6), highlighting the need for a deeper understanding of its outcomes in the ICU setting.

The outcome of sepsis in ICU patients encompasses various clinical parameters, including mortality rates, length of ICU stay, requirement for mechanical ventilation, development of organ dysfunction, and long-term sequelae. Understanding these outcomes is essential for guiding clinical management decisions, optimizing resource allocation, and improving patient care practices. This study aims to assess sepsis outcomes in patients admitted to the ICU, shedding light on factors influencing patient prognosis and highlighting areas for potential intervention. By analyzing mortality rates, disease severity scores, treatment modalities, and associated complications, this research seeks to provide valuable insights into sepsis's clinical course and outcomes in the critical care setting. Such insights are crucial for informing evidence-based practices and advancing strategies for managing and preventing sepsis-related morbidity and mortality in the ICU.

This article reviews corticosteroid pharmacology and provides evidence-based guidelines for ICU use.

## METHODOLOGY

A prospective clinical study was conducted at the Intensive Care Unit (ICU) at Bahria Town International Hospital Lahore Hospital from March 2023 to December 2023. This research adhered to the strobe guidelines. Informed consent was obtained from all the individuals who fulfilled our inclusion criteria. The hospital's institutional review board approved the conduct of this study. Individuals hospitalized in the ICU were assessed for eligibility. The study excluded patients under 18 years old and those having ICU LENGTH OF STAY shorter than 24 hours. Patients with severe sepsis/septic shock at ICU admission or during hospital stay were enrolled. Individuals readmitted to the ICU during the same hospitalization were not considered. Severe sepsis and septic shock were established, according to the American College of Chest Physicians/Society of Critical Care Medicine.

The study focused on determining the incidence and hospital mortality rates of severe sepsis and septic shock, along with risk factors for death. Our study included patients from emergency centers and

hospital wards with the community and hospital-acquired diseases. A defined procedure was used to collect data for new adult admissions to the ICU. Prospectively collected information included demographics, infection source, comorbidities, laboratory results, hospital stay, and outcomes. Patients were monitored until death or hospital discharge, whatever happened first. The lead researcher and skilled sub-investigators collected data uniformly throughout the research period.

The data was analyzed using SPSS 21 software. The numerical parameters were shown as mean ± SD. Categorical variables were described using frequency percentages. We used binary logistic regression and multivariate statistics to discover variables affecting patient survival and death.

## RESULTS

Sixty individuals met our inclusion parameters and were enrolled in our research. The mean age of the participants was 55.55±20.32 years. Males constituted 58.3% of the study population. The mean length of hospital stay was 6.43± 3.54 days (Table 1).

43.3% of the people had a diagnosis of severe sepsis, while 56.6% of the study population had an established diagnosis of septic shock. 35(58.3%) of the people were discharged after successful treatment, while 41.6% died.

35% of the study population had positive blood culture laboratory results, 26.6% of the people had positive urine culture results, and 20% of the people had positive sputum culture results. Severe sepsis had a mortality rate of 11.5%, while the mortality rate of septic shock was 64.7%. According to microorganism isolates from cultures, Escherichia coli ESBL was the most often detected bacterium.

The most common site of infection was the Lungs. Out of 60 cases, 25 (41.6%) had an infection involving the lungs' tissues. The next common site of infection found in our study was urinary tract infection (10%). Soft tissue infection was found in 6.66% of the total cases, and abscess was found in 5% of the total cases. The Breakdown of the sites of infection and the corresponding death rate against each site is shown in Table 2.

**Table 1: Patients demographics**

| Variable | Results |
|---|---|
| Age in years | 55.55±20.32 |
| Gender | |
| Male | 35(58.33) |
| Female | 25(41.67) |
| Length of hospital stay (days) | 6.43± 3.54 |
| **Diagnosis** | |
| Severe sepsis | 26(43.3) |
| Septic shock | 34(56.6) |
| **Outcome** | |
| Discharged | 35(58.3) |
| Dead | 25(41.6) |
| **Blood culture** | |
| Positive | 21(35) |
| Negative | 39(65) |
| **Urine culture** | |
| Positive | 16(26.6) |
| Negative | 44(73.3) |
| **Sputum culture** | |
| Positive | 12(20) |
| Negative | 48(80) |
| **Mortality** | |
| Severe sepsis | 3(11.5) |
| Septic shock | 22(64.7) |

**Table 2:Site of infection**

| Variable | Outcome | | Total |
|---|---|---|---|
| | Died N=25 | Discharged N=35 | |
| Lung | 11 | 14 | 25(41.6) |
| CNS | 3 | 1 | 4(6.66) |
| Urinary tract | 1 | 5 | 6(10) |
| Skin/ soft tissue | 2 | 2 | 4(6.66) |
| Abscess | 1 | 2 | 3(5) |
| Abdomen | 1 | 1 | 2 (3.33) |
| Lung + Urinary tract | 3 | 1 | 46.66) |
| Lung + CNS | 3 | 3 | 6(10) |
| Line sepsis | 0 | 2 | 2(3.33) |
| Genital tract | 0 | 2 | 2(3.33) |
| CNS + Urinary tract | 0 | 2 | 2(3.33) |
| Total | 25 (41.6) | 35(58.3) | 60 |

**Table 3 Factors related to sepsis outcome.**

| Variable | Exp (B) | CI [95%] |
|---|---|---|
| Gender | 1.082 | [0.665 – 1.781] |
| Age | 0.989 | [0.977 – 1.009 |
| Length of hospital stay | 0.965 | [0.978 – 1.179] |
| Blood Culture Positive | 1.731 | [1.041 – 2.892] |
| Urine Culture Positive | 0.361 | [0.192 – 0.666] |
| Sputum Culture Positive | 0.812 | [0.423– 1.561] |
| Hospital Acquired Infections | 0.999 | [0.752 – 1.342] |
| Co-morbidities | 1.009 | [0.997 – 1.041] |
| CNS complications | 2.597 | [1.362 – 4.965 |
| Renal complications | 4.678 | [2.378 – 9.283] |
| Respiratory complications | 22.654 | [2.865 – 57.275] |
| Septic shock | 23.735 | 11.432 – 49.654 |

Binary logistic regression was used using outcomes as the dependent variable. Every variable often mentioned in the literature was included in the model, and odd ratios were determined to see whether there would be an association between the variables and the sepsis patients' outcomes. The LOS, sex, or age was not significantly correlated with the patient's outcome (i.e., discharged or died).On the other hand, a marginal correlation was found between the number of hospital days and the treatment's result (1.092 [1.003 – 1.181], 0.048). A positive blood culture was found to be a significant predictor of patient outcomes, either death or discharge, in addition to the duration of hospital stay.

Patients with septic shock had a significantly increased risk of death (23.735 [11.432 – 49.654]). Complications with the respiratory, renal, and central neurological systems increased the likelihood of death (Table 3).

## DISCUSSION

This is one of the handful of prospective studies in Pakistan that focuses on sepsis outcomes in healthcare facilities. In the research, 34 (56.6%) patients were diagnosed with septic shock, whereas 26 (43.3%) suffered from sepsis. Surprisingly, only 3 (11.5%) of severe sepsis patients died, while the rest, 23 (88.5%), received adequate treatment and were discharged. This study found a much greater survival rate for severe sepsis patients compared to worldwide ICU settings where fatality rates range between 20-50% (7).

Our death rate for severe sepsis was 11.5%, which is lower than the 37.9% reported by J Prest and colleagues. (8). Comparing outcomes across studies might be challenging due to methodological differences. The same diagnostic standards but different research

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methods and inclusion/exclusion criteria may explain some variations. However, it was noted that a very high 22(64.7%) death rate existed among individuals suffering from septic shock.

The latest multicenter research has shown that the patient group experiencing sepsis and septic shock has a cumulative rate of 28.4% (9).

When our findings were compared to those of this multicenter investigation, it became apparent that the cumulative death rate from septic shock and severe sepsis was 41.3%. This is far more than research conducted in advanced nations. (10).When compared to ICU practices in Pakistan, the average death rate is shown to be greater than 30.0% (11)On the other hand, septic shock mortality was similar to that of AR ullah's research. Therefore, it is essential to consider all the variations in our research population when comparing our findings with those of other research projects conducted worldwide.

Here, access to high-quality primary care is sporadic, and early illness severity detection is frequently overlooked. For various reasons, such as financial constraints and travel from distant rural areas, our patients may arrive much later than expected **7.** This circumstance, however, is somewhat consistent with specific observational research that implies the death rate may still be greater than that published from interventional investigations, which frequently exclude patients with the most significant risk categories and also explicitly organize the provision of care (12).

Finding the variables linked to a patient's death is undoubtedly one of the most challenging tasks. Numerous variables may be related to the survival or death of individuals with sepsis and septic shock. Regarding the current study's findings, it was observed that around 58.3% of the participants were male. On the other hand, it was shown that female gender contributed marginally to mortality 1.081 [0.671 – 1.752]. Throughout their entire hospital stay, we examined adult patients who had sepsis. When considering individuals with sepsis of European descent (5), our subjects were younger, with a median age of 57 years. Therefore, clinical characteristics may significantly impact mortality more than a comparison based on gender 35% had positive blood culture laboratory results. In contrast, urine culture was positive in 26.6% of the people, and sputum culture was positive in 20% of the study population. A positive blood culture increased the likelihood of death (1.731 [1.041 – 2.892]. Additionally, individuals with positive urine cultures had a mortality risk that was at least 35% greater (0.361 [0.192 – 0.666].

These findings support a recent study's findings that individuals with UTIs and E. coli-positive cultures had increased fatality rates (13).it was observed that patients experiencing septic shock had a 23.735[11.432 – 49.654] times greater probability of dying; similarly, patients with respiratory complications had a 22.654 [2.865 – 57.275] higher chance of dying. Therefore, patients with septic shock and respiratory infections had the highest likelihood of dying. These findings are in line with the conclusions of the previous research (14, 15).

The pulmonary and genitourinary systems and indwelling catheters are the most prevalent places for infections in septic patients, as reported in the published literature **(16)**.Our data indicate that respiratory infections were the most prevalent (41.6%), followed by urinary tract (10%), soft tissue infections (6.6%), and abdominal (3%). All these findings are by the study done by other authors in Pakistan (17).

Our study had many limitations that should be considered while interpreting these results. First, the small sample size limits the generalization of the findings. Second, the limited sample size reduces the research's statistical significance. The research also has other limitations, including a lack of consideration for different complications in the study population.

## CONCLUSION

In conclusion, our study underscores the high mortality rate associated with severe sepsis and septic shock in ICU patients, with positive blood culture and septic shock being significant predictors of mortality. Early recognition and management of these factors are crucial for improving patient outcomes in sepsis. Further research is warranted to explore additional factors influencing sepsis outcomes and to develop targeted interventions aimed at reducing mortality in this high-risk patient population.

## DECLARATIONS

**Data Availability statement**

All data generated or analyzed during the study are included in the manuscript.

**Ethics approval and consent to participate**

Approved by the department concerned.

**Consent for publication**

Approved

**Funding**

Not applicable

## CONFLICT OF INTEREST

The authors declared the absence of a conflict of interest.

## AUTHOR CONTRIBUTION

***RIZWAN PERVAIZ***
*Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript.*
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*Study Design, Review of Literature.*
***MUBASHAR SULTAN HASHMI***
*Conception of Study, Final approval of manuscript.*
***HASSAN AHMED***
*Manuscript revisions, critical input.*
***ADEEL***
*Data entry and Data analysis, drafting article.*
***ARISH ASGHAR***
*Manuscript drafting.*
***SABA ZARTASH***
*Coordination of collaborative efforts.*

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