

ORIGINAL ARTICLE

Early Diagnosis of Sepsis in Emergency Departments, Time to Treatment and Association with Mortality

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ABSTRACT

Introduction: Sepsis is a major cause of mortality associated with emergency department (ED) visits. In 2018, the Surviving Sepsis Campaign (SSC) recommended the following strategy to improve patient survival rates.

Objectives: The main objective of the study is to find the early diagnosis of sepsis in emergency departments, time to treatment and association with mortality.

Material and methods: This cross sectional study was conducted in Akbar Niazi Teaching Hospital, Barakahu, Islamabad during March 2022 till August 2022. The data was collected with the permission of ethical committee of hospital. The inclusion criteria were clinically suspected infection on presentation to an emergency department and at least two systemic inflammatory response syndrome signs, not including high leukocyte counts.

Results: Out of 100 patients with sepsis, 97 were included for analysis, exclusions being due to incomplete information. 54% were male and 46% female. The age distribution was similar in both the genders with mean age being 54±2 years in males and 50±2 in females ($p=0.30$). Diabetes mellitus was the leading co-morbid present in 21 males as opposed to 18 females, followed by hypertension in 22 males and females respectively. Practical implication: This study will help in finding the procedure of sepsis and organ failure.

Conclusion: It is concluded that procedures for recognizing sepsis and organ failure in the emergency department were delayed or not carried out in a substantial proportion of patients with sepsis.

Keywords: Sepsis, Patients, Failure, Survival, Fluid

INTRODUCTION

Sepsis is a major cause of mortality associated with emergency department (ED) visits. In 2018, the Surviving Sepsis Campaign (SSC) recommended the following strategy to improve patient survival rates: (i) blood cultures and blood lactate measurements should be performed immediately, (ii) empirical antibiotics should be administered within 1 h of recognition of the signs of sepsis, and (iii) adequate fluid resuscitation should be given, and vasopressor use should be implemented in patients who remain hypotensive after fluid resuscitation¹.

Screening for sepsis in EDs is important for early diagnosis and initiation of sepsis care. In previous studies, several sepsis screening tools (e.g., the systemic inflammatory response syndrome, the early warning score, the quick Sequential Organ Failure Assessment (qSOFA), and lactate measurements plus qSOFA) on mortality rates were compared². However, the screening tool's impact on the sepsis bundle was remained unclear. Several studies show administering appropriate antibiotics within 3 h in patients with suspected sepsis and within 1 h in patients with septic shock was associated with increased survival rates³.

Public health and policy efforts seek to reduce the morbidity and mortality associated with sepsis and septic shock through state regulations mandating care, public reporting of hospital performance, the creation of national learning networks, and patient-facing public awareness campaigns. Despite these efforts, death and incomplete recovery in the following 2 years remains elevated⁴.

Risk-adjusted mortality varies between regions and hospitals, suggesting that nonstandard clinical treatment pathways leave opportunities to improve. Sepsis care may be most consequential during the earliest phase of treatment⁵. Sepsis in most hospitalized patients in the US (86%) is diagnosed on admission, and up to 80% receive initial care in the ED. Furthermore, over 75% of ED sepsis patients are treated by emergency medical services (EMS) providers in the out-of-hospital environment. Thus, both out-of-hospital and in hospital emergency care are key in identifying sepsis and initiating early care for those with life-threatening infection⁶.

Many aspects of emergency sepsis care recognition, prompt and adequate antibiotic therapy, and circulatory support with fluids and vasopressors for those with septic shock have evidence-based

guiding actions that improve outcomes. Given the inherent difficulty in establishing the early diagnosis of sepsis, any guidance must recognize care elements that influence the timeliness and outcomes of care⁷. Aspects that challenge early care include competing ED diagnoses and care, varying levels of evidence for sepsis recommendations, and treating patients with unnecessary therapy when they ultimately have diagnoses other than sepsis⁸.

Objectives: The main objective of the study is to find the early diagnosis of sepsis in emergency departments, time to treatment and association with mortality.

MATERIAL AND METHODS

This cross-sectional study was conducted in Akbar Niazi Teaching Hospital, Barakahu, Islamabad during March 2022 till August 2022. The data was collected with the permission of ethical committee of hospital. The inclusion criteria were clinically suspected infection on presentation to an emergency department and at least two systemic inflammatory response syndrome signs, not including high leukocyte counts. We excluded high leukocyte counts as a criterion because the result of the blood sample in many cases would not be available for the clinicians when they do their initial judgment of severity of the patient's condition. Patients included in this study were evaluated by emergency room staff. We recorded each patient's demographic information (age, sex, and comorbidities), vital signs (systolic blood pressure, respiratory rate, body temperature, and pulse oxygen saturation) and blood lactate levels were assessed upon admission. Data collected from hospital database software were used for this study. To assess the timeliness of diagnostic procedures, we calculated the percentages and 95% confidence intervals of patients with sepsis who had been documented as undergoing diagnostic procedures and receiving antibiotics within specified time limits.

Data was collected and analyzed using SPSS version 21.0.

RESULTS

Out of 100 patients with sepsis, 97 were included for analysis, exclusions being due to incomplete information. 54% were male and 46% female. The age distribution was similar in both the genders with mean age being 54±2 years in males and 50±2 in females ($p=0.30$). Diabetes mellitus was the leading co-morbid present in 21 males as opposed to 18 females, followed by hypertension in 22 males and females respectively.

Table 1: Comparison of patient characteristics

	Male	Female	P-value
Age in years (mean±SD)	54±17	50±16	0.300
Sepsis on admission	36 (69%)	32 (71%)	0.840
Septic shock on admission	16 (31%)	13 (29%)	0.840
Co-morbidities			
Diabetes mellitus	21 (40%)	18 (40%)	0.969
Hypertension	22 (42%)	22 (49%)	0.516
Ischemic heart disease	11 (21%)	11 (24%)	0.670
Chronic renal disease	12 (23%)	12 (27%)	0.683
Chronic liver disease	5 (10%)	1 (2%)	0.211
Type of infection			
Lower respiratory tract infection	20 (38%)	27 (60%)	0.034
Urinary tract infection	17 (33%)	20 (44%)	0.235
Bloodstream infection	11 (21%)	14 (31%)	0.264
Intra-abdominal infection	5 (10%)	0 (0%)	0.033

As gender and IL-6 levels had significant relationship with mortality, to determine possible interdependency of these variables with comorbidities and site of infection, logistic regression analysis was performed.

Table 2: Multivariate analysis with mortality as dependent variable

Variable	P-value
Gender	0.046
Age group	0.254
Diabetes mellitus	0.691
Ischaemic heart disease	0.367
Respiratory tract infection	0.006
Urinary tract infection	0.029
Plasma IL-6 level	0.016

DISCUSSION

Sepsis has been a major cause of mortality and morbidity worldwide. It is the leading cause of death overall and is the most common cause of shock in the United States [8]. Despite recent advances in diagnosis and management, mortality from sepsis remains high, ranging from 15% in patients with sepsis to 40-50% in patients with septic shock with multi-organ dysfunction syndrome (MODS)⁹. It has been observed that hormonal differences may play a role in development of chronic autoimmune and inflammatory diseases such as multiple sclerosis, lupus, or rheumatoid arthritis in women¹⁰.

Studies have shown that the immune response to infection as well as the incidence of sepsis differs between sexes. Data from animal studies suggests that females have advantageous immunologic responses during infections. Epidemiologic studies consistently report higher sepsis incidence in males¹¹⁻¹².

However, the influence of gender on severe infections is still highly controversial and although animal studies have indicated a survival advantage for females, it seems to be contradictory to human clinical data on sepsis related mortality¹³. Eachempati et al. has highlighted that female gender as an independent predictor of increased mortality in patients with documented infection in a surgical intensive care unit (ICU). Hence the data seen in sepsis patients with respect to differences in outcomes in relation to gender has so far has been equivocal¹⁴.

Moreover role of cytokines has been extensively studied in order to gain better insight into the processes that influence outcome in sepsis. Multiple organ dysfunction is due to a severe inflammatory reaction resulting from systemic cytokine release¹⁵. The pro-inflammatory reaction is mediated by tumor necrosis factor (TNF-α), interleukin (IL) 1 and IL-6. The body also mounts an immediate anti-inflammatory response largely mediated by IL-10¹⁶. In a prospective study from Germany, gender differences in patients with surgical sepsis were evaluated in terms of survival, sex hormones, and proinflammatory as well as anti-inflammatory mediators. The study demonstrated a significantly better prognosis for women, which may be related to increased levels of anti-inflammatory mediator IL-10¹⁷⁻¹⁸.

CONCLUSION

It is concluded that procedures for recognizing sepsis and organ failure in the emergency department were delayed or not carried out in a substantial proportion of patients with sepsis. This higher mortality appears to be related to differences in respiratory tract infection rate and IL-6 plasma levels, between the genders.

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