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Predictors of Mortality Assessment in Sepsis Patients in Intensive Care Unit at a Tertiary Care Hospital

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Abstract

Introduction: Infectious diseases are the most leading cause of morbidity and mortality among worldwide. The second leading cause of death is sepsis, septic shock is a life-threatening condition that increases the rate of hospitalization and mortality. Severe sepsis can be categorized by presence of one or more organ dysfunction i.e., metabolic acidosis, acute encephalopathy, oliguria, hypoxemia, coagulation or persistent hypotension. To find out the mortality rate of the patients with sepsis or severe sepsis can be done by using various scoring systems like GCS (Glasgow Coma Score), APACHE II and III, SOFA score. This can improve the patient care and also used for predicting the mortality of the sepsis or severe sepsis patients admitted in the ICU.

Methodology: It was a prospective observational study conducted for about 6 months. The study includes the patients with sepsis, severe sepsis and septic shock. The study excludes patients not with sepsis, pregnancy and lactating females. Data was collected from the ICU and analyzed by using SPPS software 20.0 for windows.

Results and discussion: Our study was aimed to estimate the mortality among adult patients admitted in the medical ICU with severe sepsis, sepsis. The total sample of 54 patients admitted to medical ICU and the mortality rate among them is 39%, and survival rate in them is 61%. The major co-morbidities observed in this study are a history of fever, diabetes mellitus, and respiratory co-morbitesis. Patients who are positive to sepsis or septic shock were having higher mean CRP (170.22 ± 129.01) when compared with survival group (131.88 ± 112.05). Hence, higher level of CRP indicated the high mortality rate.

Conclusion: Present study showed 39% of mortality with increased CRP, serum lactate levels and body temperature are found to be clear predictors of mortality in sepsis, severe sepsis and septic shock by using SOFA score.

Keywords: Sepsis; Mortality risk assessment; SOFA score; Predictors of mortality

Introduction

Infectious diseases are the most leading cause of morbidity and mortality among worldwide. The second leading cause of death is sepsis, sepsis or septic shock is a life-threatening condition that increases the rate of hospitalization and mortality. It adversely affects the quality of life of those individuals who effected with sepsis. In 2016 new definitions were developed for sepsis or septic shock the major difference between old sepsis (sepsis-2) and new sepsis (sepsis-3) alters by epidemiology and Systemic Inflammatory Response Syndrome of (SIRS) criteria. The severe organic dysfunction is usually noted based on the presence or absence of refractory hypotension, respiratory failure, abdominal infections, urinary tract infections and major trauma conditions. Typically 50% of all sepsis starts with an infection in lungs. Sepsis can majorly be identified by the presence of bacteremia; it means isolation of one or more micro-organisms with SIRS positivity. Severe sepsis can be categorized by the presence of one or more organ dysfunction i.e., metabolic acidosis, acute encephalopathy, oliguria, hypoxemia, coagulation or persistent hypotension. To find out the mortality rate of the patients with sepsis or severe sepsis can be done by using various scoring systems like GCS (Glasgow Coma Score), APACHE II and III, SOFA score [1].

By using the scoring systems that can save them time, improve the patient care and also used for predicting the mortality of the sepsis or severe sepsis patients admitted in the ICU, each scoring system has different parameters to evaluate the mortality rate of the sepsis patients admitted in ICU. Increased levels of lactate in critically ill patients with sepsis, severe sepsis or septic shock this can helps more easily for identifying the mortality by the bedside of the patient. Sepsis represents a deranged systemic inflammatory response to infection that can progress to multi-organ dysfunction and also leads to shock, this inflammatory response can be triggered by microbial antigens, intrinsic factors released that are released into blood circulation mainly by trauma or infectious conditions or other health-related diseases. Most of the epidemiological data were obtained from western countries, in 1995 750,000 people were hospitalized due to sepsis or severe sepsis was increased rapidly. Diagnosing sepsis early is crucial so that appropriate treatment can be started promptly and patients given the best possible chances of survival. In India overall mortality rate of all sepsis patients is 14% and severe sepsis was alone higher that is approximately 50%. Sepsis majorly caused by bacteria

like methicillin-resistant staphylococcus aureus bacteria, vancomycin-resistant Enterococcus species of bacteria, Neisseria, Candida and other gram-negative bacteria like E-coli, influenza in neonates.

The average cost of spending on sepsis for the length of stay in the hospital, laboratory tests, culture tests, medications cost, and other costs are in high amount and it also depends on the patient severity on an average hospital stay from 1 to 5 days is Rs. 28, 275 and for 10 to 20 days is Rs. 50, 699. This may be variant from hospital to hospital [2].

Methodology

Study design, study site, and duration of the study

It was a prospective observational study done at medical intensive care units in a tertiary care hospital. The study was done for about 6 months that is from June 2019- November 2019.

Our study was followed the both criteria's

Inclusion criteria: The inclusion criteria of the study are including both the genders, patients admitted in ICU with SIRS, sepsis, severe sepsis and septic shock.

Exclusion criteria: The study excludes children, patients with no sepsis and pregnant and lactating women.

Study material

In this study, we collected patient demographic details, comorbidities, presence of sepsis before admission or after admission, details for any trauma conditions these initial parameters were collected from the case reports [3].

Study procedure

Presence of sepsis can be identified by Systemic Inflammatory Response Syndrome (SIRS) with suspected or presence of microbial culture in blood, pus, epithelial and urine were identified and SIRS include any two of the following conditions may indicate the presence of sepsis in the individual patient along with above parameters; those are 1. Hyper and Hypothermia (body temperature greater than or less than 98.6°F), 2. Respiratory rate (greater than 20/min), 3. Heart rate (greater than 90 beats/min), 4. Hyperventilation ($PaCO_2$ less than 32 mmHg), 5. WBC count (greater than 12000/mm^3 or less than 4000/mm^3), 5. Hyperglycemia (>140 mg/dl), 6. Serum lactate levels (<18 mg/dl), 7. Creatinine (>2.0 mg/dl).

All patients were subjected to CRP levels(C-reactive protein), complete blood count, hepatic and renal function tests, atrial blood gases, serum electrolytes, prothrombin time and blood cultures and culture specimens from the primary infection site. Mortality of sepsis was scored within 24 hours and identifies the 7th-day mortality of patients with sepsis, septic shock, and severe sepsis, by using the SOFA scoring system.

Statistical analysis

Descriptive statistics were applied for data variables. The p-value of less than < 0.05 is considered as statistically significant. Data were analyzed by using a Statistical Analysis Package for Social Sciences (SPSS) 20.0 for windows.

Ethical approval

The study was approved by the Institutional Ethics committee (IEC) of Nirmala College of Pharmacy, Atmakur, Guntur district, Andhra Pradesh [4].

Results and Discussion

Assessment of mortality rate

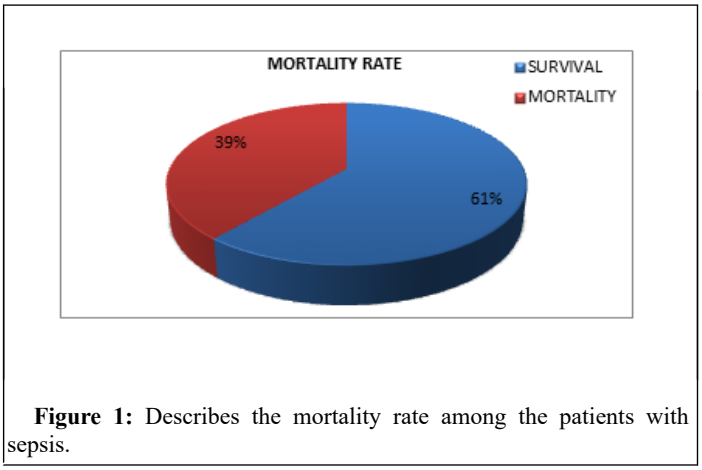

Figure 1: Describes the mortality rate among the patients with sepsis.

It is interesting to note that most of the biomarkers we identified have been tested clinically and not experimentally. Clinical and standard laboratory tests are not very helpful because most critically ill patients develop some degree of inflammatory response, whether or not they have sepsis. Even microbiological assessment is unreliable because many culture samples do not yield microorganisms in these patients. The predictive validity of the systems depends on the demographics of the patients, the disease condition and severity, and the infrastructure and facilities of the ICU. Patients who died with sepsis tended to be older adults with multiple co-morbidities and recent hospitalizations, and underlying causes of death were mostly associated with severe chronic comorbidities. Other important predictors of mortality were identified in our study, namely lactate level and mean urine output.

Comparison of risk factors and mortality

Our study was aimed to estimate the mortality among adult patients admitted in the medical ICU with severe sepsis, sepsis. To identify the risk factors which are predictors of mortality in a short time. The total sample of 54 patients admitted to the medical ICU and the mortality rate among them is 39%, and survival rate in them is 61%. Among fifty-four patients the age less than 60 was 20 members among them mortality rate was 45% and patients with greater than 60 were 34 members among them mortality rate was 56%.

The major co-morbidities observed in this study are a history of fever, diabetes mellitus, and respiratory co-morbitesis. In these fifty-four patients, the most common chief complaints are fever, body pains, breathlessness, cough and other abdominal and neurologic problems are observed. Out of these 54 patients, the culture reports were positive and mortality among them is 78.5% and isolated at least one micro-organism from blood, urine, sputum, and other specimens [5].

The most common bacteria isolated are *E.Coli*, *Klebsiella Pneumoniae*, *Acinetobacter Baumannii*, *Streptococcus Species*, *Candida Albicans*, *Proteus Mirabilis*. The mean age of those patients who succumbed to sepsis (67.22 ± 10.8) was lower than the survival group (58.75 ± 14.37. The mean of temperature in the mortality group (99.45 ± 1.71) and it was higher than survival group (99.16 ± 0.97) and serum lactate levels were also compared this shows higher in mortality group (41.31 ± 28.87) when compared with survival group (25.69 ± 19.59).

Risk Factors	Classification (n)	Mortality n (%)
Age	<60 (20)	9(45%)
	>60 (34)	28(56%)
Gender	Males (39)	21(53.84%)
	Females (15)	11(73.33%)
Diabetes mellitus	Present (32)	28(87.5%)
	Absent (22)	15(68.18%)
CLD and CKD	Present (24)	11(45.83%)
	Absent (30)	7(23.33%)
History of fever	Present (34)	27(79.41%)
	Absent (20)	8(40%)
Culture reports	Positive (14)	11(78.5%)
	Negative (40)	15(37.5%)

Table 1: Comparison of risk factors and mortality.

Patients who are positive to sepsis, severe sepsis or septic shock were having higher mean CRP (170.22 ± 129.01) when compared with survival group (131.88 ± 112.05). Hence, a higher level of CRP indicated a high mortality rate.

Other factors like sodium, potassium, bilirubin, SGOT, SGPT were normalized in ratio between mortality and survival group. The mean SOFA score among who are with sepsis, severe sepsis or septic shock were higher in mortality group (14.95 ± 2.214) when compared with survival group (9.15 ± 2.93).

Conclusion

The present study showed 39% of mortality with increased CRP, serum lactate levels and body temperature are found to be clear predictors of mortality in sepsis, severe sepsis, and septic shock by using SOFA score. Asepsis mortality prediction formula based on SOFA scores and CRP levels and serum lactate levels has greater predictive power of scoring the mortality in sepsis patients admitted in ICU.

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Conflict of Interest

Authors do not have any conflict of interest relevant to this article for publication.

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