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Original Research Article

Clinical Outcomes and Prognostic Determinants in Sepsis: A Retrospective Study

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Abstract:

Background: Sepsis is a life-threatening syndrome caused by a dysregulated host response to infection, resulting in organ dysfunction and high mortality. Identifying prognostic determinants is critical for guiding management and improving outcomes.

Aim: To evaluate clinical outcomes and determine prognostic factors influencing 28-day survival in hospitalized sepsis patients.

Methodology: A retrospective observational review was conducted on 80 adult patients with sepsis admitted to the Department of General Medicine, Government Medical College Hospital, Bettiah, India. Demographics, comorbidities, infection sources, laboratory parameters, disease severity, ICU stay, and Traditional Chinese Medicine (TCM) syndromes were analyzed. Statistical analyses included univariate and multivariate logistic regression to identify predictors of 28-day mortality.

Results: The cohort had a slight male predominance (56.3%) with most patients aged 41–60 years (43.8%). Sepsis accounted for 65%, and septic shock 35% of cases. Hypertension (37.5%) and diabetes (31.3%) were the most common comorbidities. Respiratory tract infections predominated (43.8%). Laboratory analysis showed elevated CRP and procalcitonin, leukocytosis with neutrophilia, and coagulation abnormalities. TCM patterns were most frequently Toxin-Heat (35%) and Blood Stasis (27.5%). Overall, 28-day survival was 68.8%.

Conclusion: Clinical outcomes in sepsis are influenced by age, comorbidities, infection source, inflammatory and coagulation parameters, and TCM syndromes. Early identification and targeted interventions are vital for improving survival.

Keywords: Sepsis, Prognostic Determinants, Clinical Outcomes, Inflammation, Coagulation, TCM Syndromes.

Introduction

Sepsis is a complicated medical condition which puts patients at fatal risk because their bodies react incorrectly to infections, which results in sudden organ failure together with severe health complications and death [1]. The 2016 international consensus issued by the European Society of Intensive Care Medicine combined with the Society of Critical Care Medicine defines sepsis as a dangerous medical condition which causes organ failure through an unregulated body reaction to infection because of its severe effects on patient survival and global healthcare systems [2]. Sepsis demonstrates its clinical symptoms through a variety of signs which range from mild physiological abnormalities to severe multi-organ failure, which creates difficulties for early diagnosis and proper treatment. The different ways patients show their symptoms create difficulties for doctors to make correct diagnoses, which makes it necessary to find trustworthy factors that can predict patient outcomes to help medical staff make treatment decisions.

Sepsis continues to create significant challenges for public health systems around the world. The Global Burden of Disease study from 2020 which provided new epidemiological data showed that approximately 49 million people worldwide experience sepsis each year and sepsis together with its complications causes 11 million deaths annually. The data shows that sepsis accounts for 19.7 percent of all

global deaths which demonstrates the significant healthcare costs and social effects that sepsis creates for society [3]. The sepsis death rates remain excessively high because the medical field has developed better treatments while hospitals now use common treatment methods. The Surviving Sepsis Campaign Guidelines have helped hospitals reduce their death rates which started at 37 percent and now stand at about 30 percent during the last ten years [4]. The existing data shows serious problems which include delays in disease detection and treatment and shortcomings in effective treatment approaches.

The rising number of sepsis cases in hospitalized patients demonstrates its important role in medical practice. The last ten years have shown a nearly double increase in sepsis cases for specific healthcare facilities which demonstrates the dual impact of enhanced healthcare awareness and diagnostic methods and the demographic changes of older patients who have multiple health issues and the common use of invasive techniques and the existing problem of antimicrobial resistance [5]. The research work indicates that sepsis presents with different clinical symptoms which results in delayed identification of the condition and leads to insufficient treatment which results in the high death rate from the illness [6]. The process of identifying sepsis at an early stage needs to assess patient risk and medical teams should use evidence-based treatments to restore better health outcomes while minimizing death rates.

The term 'sepsis' does not exist in Traditional Chinese Medicine (TCM) classical texts yet researchers can use its clinical symptoms and disease development to classify it into specific TCM syndromes. The included TCM syndromes consist of 'internal collapse of gangrenous toxin (ju du nei xian)', 'bi syndrome (bi zheng)', 'warm disease (wen bing)' and 'yellowing of furuncle (ding chuang zou huang)' [7]. TCM identifies four vital components which establish the pathogenesis of diseases through the term's 'toxin' 'heat' 'stasis' and 'deficiency'. TCM methods maintain their focus on two main objectives which involve restoring systemic balance through host balance correction and elimination of pathogenic toxins and blood stasis from the body. Contemporary TCM practitioners recognize Professor Wang Jinda's framework of 'four syndromes and four methods' as a complete approach for managing sepsis. Sepsis divides into four syndromes which include toxin-heat syndrome and blood stasis syndrome and acute deficiency syndrome and bowel qi obstruction syndrome. The required treatments for this condition include heat-clearing and toxin-resolving (Qing Re Jie Du) methods and blood-activating and stasis-dispelling (Huo Xue Hua Yu) methods and strengthening body resistance and consolidating the root (Fu Zheng Gu Ben) methods and purgation and downward-draining (Tong Li Gong Xia Fa) methods [8].

The systemic management of sepsis benefits from TCM yet modern clinical practices depend on prognostic factors and objective assessment methods to measure patient outcomes. The essential prognostic indicators consist of patient demographic information together with existing medical conditions and infection details which include both its source and severity and organ dysfunction assessments and laboratory tests that measure lactate levels and procalcitonin levels and inflammatory cytokine concentrations. Clinicians use retrospective analysis of these factors to classify risk levels while predicting future complications and developing specific treatment strategies. The study of host factor interactions with infection pathophysiological responses reveals potential therapeutic targets which help develop individualized treatment plans.

Research on sepsis has made major progress but researchers still lack complete understanding about how various factors affect patient clinical results. Researchers use hospital record data through their retrospective studies to discover patterns between different risk factors which lead to adverse outcomes in sepsis patients. The studies track patient outcomes through their assessment of patient characteristics and laboratory results and treatment methods thus creating evidence which improves clinical management and guides future research studies. The current retrospective study investigates sepsis patient outcomes while determining which factors affect their survival rates and complication occurrences and overall health outcomes. The analysis provides necessary information which helps to develop improved treatment protocols and better resource management while decreasing worldwide sepsis rates.

Sepsis continues to pose a worldwide health problem which results in elevated rates of sickness and death because treatment methods and clinical guidelines fail to achieve effective results. Epidemiological studies underscore the extensive burden of disease, while clinical research continues to highlight the complexity and heterogeneity of patient presentations. The combination of current medical knowledge and traditional practices together with detailed assessment of all significant factors that influence patient success will lead to better treatment results. This retrospective review aims to contribute to this understanding by analyzing clinical outcomes and identifying key factors that may guide more effective management of sepsis in hospitalized patients".

Methodology

Study Design: This study was designed as a retrospective observational review aimed at evaluating clinical outcomes and identifying prognostic determinants in patients diagnosed with sepsis. The retrospective approach allowed the collection and analysis of pre-existing patient data to investigate

demographic characteristics, comorbidities, infection sites, laboratory parameters, and treatment outcomes. The primary objective was to correlate these factors with 28-day survival status, thereby elucidating key predictors of mortality and recovery in sepsis patients.

Study Area: The study was conducted in the Department of General Medicine, Government Medical College Hospital, Bettiah, West Champaran, Bihar, India.

Study Duration: The retrospective data collection covered a period of six months from March 2025 to August 2025.

Study Participants

Inclusion Criteria:

- Patients aged 18 years and above.
- Confirmed diagnosis of sepsis according to the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3), characterized by a documented infection plus a Sequential Organ Failure Assessment (SOFA) score ≥2 points.
- Complete medical records with demographic, laboratory, and clinical data available.
- Patients fulfilling Traditional Chinese Medicine (TCM) syndrome differentiation criteria for sepsis, including toxin-heat syndrome, acute deficiency syndrome, blood stasis syndrome, or bowel qi obstruction syndrome.

Exclusion Criteria:

- Patients who did not meet the diagnostic criteria for sepsis or had incomplete medical records.
- Pregnant or lactating women.
- Patients with terminal illnesses or conditions that could confound sepsis-related outcomes.

Sample Size: A total of 80 patients meeting the inclusion criteria were included in this study. This sample size was determined based on available hospital records and the feasibility of capturing complete clinical and laboratory data.

Procedure: Patient records were retrieved from the hospital database and systematically reviewed. Each patient was categorized into either the survival or death group based on their 28-day post-admission outcome. Data collected included demographic information (age, sex), vital signs (temperature, heart rate, respiratory rate, mean arterial pressure), comorbidities (cardiac, respiratory, renal, metabolic, and hepatic conditions), and primary sites of infection (respiratory tract, urinary tract, bloodstream, gastrointestinal, skin/soft tissue). The length of ICU stay and disease severity (sepsis or septic shock) were also documented. Laboratory parameters, including inflammatory markers (C-reactive protein, procalcitonin), hematological indices (white blood cell count, neutrophils, lymphocytes, red blood cells, hemoglobin, platelets), and coagulation indices (prothrombin time, activated partial thromboplastin time, thrombin time, fibrinogen, fibrinogen degradation products, D-dimer), were extracted from medical records. Additionally, TCM syndrome differentiation was assessed based on documented clinical signs, tongue characteristics, pulse patterns, and symptomatology. All data were anonymized to maintain patient confidentiality.

Statistical Analysis: All statistical analyses were performed using SPSS version 27.0. Continuous variables were assessed for normality and analyzed accordingly: normally distributed data were expressed as mean ± standard deviation and compared using independent samples t-tests, while non-normally distributed data were expressed as median with interquartile ranges and compared using the Mann–Whitney U test. Categorical variables were reported as frequencies and percentages and compared using the chi-square test or Fisher's exact test as appropriate. Univariate and multivariate logistic regression analyses were conducted to identify independent prognostic factors associated with 28-day mortality. Receiver operating characteristic (ROC) curves were constructed to evaluate the predictive accuracy of significant risk factors, and the corresponding area under the curve (AUC) was calculated. A p-value of less than 0.05 was considered statistically significant throughout the analyses".

Result

Table 1 shows the demographic and general characteristics of the 80 patients included in the study. The majority of patients were in the 41–60 years age group, accounting for 35 individuals (43.8%), followed by those older than 60 years (28.7%) and the 18–40 years group (27.5%). Male patients were slightly more than female patients, with 45 (56.3%) males and 35 (43.7%) females. Regarding disease severity, 52 patients (65%) were diagnosed with sepsis, while 28 patients (35%) had septic shock. The median length of ICU stay for all patients was 8 days, with an interquartile range of 5 to 12 days, indicating variability in the duration of critical care among the study population.

Table 1: Demographic and General Characteristics of Patients (N = 80)		
Variable	**Frequency (n)**	**Percentage (%)**
Age (years)		
18–40	22	27.5
41–60	35	43.8
>60	23	28.7
Sex		
Male	45	56.3
Female	35	43.7
Disease Severity		
Sepsis	52	65
Septic Shock	28	35
Length of ICU Stay (days, median [IQR])	8 [5–12]	—

Table 2 shows the distribution of comorbidities among the 80 study participants, highlighting that hypertension (HTN) was the most prevalent condition, observed in 30 patients (37.5%), followed by diabetes mellitus (DM) in 25 patients (31.3%). Chronic kidney disease (CKD) was present in 12 patients (15%), while chronic obstructive pulmonary disease (COPD) affected 10 patients (12.5%). Heart failure (HF) was documented in 8 patients (10%), and cerebrovascular disease (CVD) in 7 patients (8.8%). Liver injury was the least common comorbidity, noted in 5 patients (6.3%). Overall, cardiovascular and metabolic disorders such as hypertension and diabetes constituted the major burden of comorbid conditions in the study population, indicating a high prevalence of chronic systemic illnesses among the participants.

Table 2: Distribution of Comorbidities (N = 80)		
Comorbidity	**Frequency (n)**	**Percentage (%)**
Hypertension (HTN)	30	37.5
Diabetes Mellitus (DM)	25	31.3
Chronic Kidney Disease (CKD)	12	15
Chronic Obstructive Pulmonary Disease (COPD)	10	12.5
Heart Failure (HF)	8	10
Liver Injury	5	6.3
Cerebrovascular Disease (CVD)	7	8.8

Table 3 shows the distribution of primary infection sites among the study participants (N = 80). The most common site of infection was Respiratory Tract Infection (RTI), accounting for 35 cases (43.8%), indicating that nearly half of the patients presented with respiratory involvement. This was followed by Urinary Tract Infection (UTI) in 18 patients (22.5%), making it the second most frequent source of infection. Bloodstream Infection (BSI) was observed in 12 cases (15%), while Gastrointestinal (GI) infections were reported in 10 patients (12.5%). Skin and Soft Tissue Infections (SSTI) were the least common, comprising only 5 cases (6.3%). Overall, respiratory infections constituted the predominant source of infection in the study population, whereas skin and soft tissue infections were comparatively rare.

Table 3: Primary Infection Sites (N = 80)		
Infection Site	**Frequency (n)**	**Percentage (%)**
Respiratory Tract Infection (RTI)	35	43.8
Urinary Tract Infection (UTI)	18	22.5
Bloodstream Infection (BSI)	12	15
Gastrointestinal Infection (GI)	10	12.5
Skin and Soft Tissue Infection (SSTI)	5	6.3

Table 4 shows the laboratory parameters of the study population expressed as mean ± SD or median [IQR]. Among inflammatory markers, the mean CRP level was markedly elevated (78.5 ± 25.3 mg/L), and the median procalcitonin level was 4.2 ng/mL [2.1–6.8], indicating a significant systemic inflammatory or infectious process. Hematological findings revealed leukocytosis with a mean WBC count of 13.5 ± 4.7 $\times 10^3/\mu L$, accompanied by neutrophilia (82.0 ± 8.5%) and relative lymphopenia (12.5 ± 6.2%), suggestive of acute bacterial infection or severe inflammation. The mean hemoglobin level

was 10.8 ± 1.6 g/dL, indicating mild anemia, while the platelet count was 165 ± 54 ×10³/μL, remaining within the lower-normal to mildly reduced range. Coagulation parameters showed a slightly prolonged PT (14.8 ± 2.1 seconds) and APTT (32.5 ± 6.0 seconds), with elevated fibrinogen levels (410 ± 85 mg/dL) and a raised median D-dimer level of 2.1 μg/mL [1.2–3.6], reflecting activation of the coagulation pathway and a possible hypercoagulable state. Overall, the laboratory profile suggests marked inflammation, hematological alterations consistent with acute infection, and evidence of coagulation activation.

Table 4: Laboratory Parameters (Mean ± SD / Median [IQR])

Parameter	Value
Inflammatory Markers	
CRP (mg/L)	78.5 ± 25.3
Procalcitonin (ng/mL)	4.2 [2.1–6.8]
Hematology	
WBC (×10³/μL)	13.5 ± 4.7
Neutrophils (%)	82.0 ± 8.5
Lymphocytes (%)	12.5 ± 6.2
Hemoglobin (g/dL)	10.8 ± 1.6
Platelet count (×10³/μL)	165 ± 54
Coagulation	
PT (seconds)	14.8 ± 2.1
APTT (seconds)	32.5 ± 6.0
Fibrinogen (mg/dL)	410 ± 85
D-Dimer (μg/mL)	2.1 [1.2–3.6]

Table 5 shows the clinical outcomes and 28-day survival status among the 80 study participants, along with the distribution of TCM syndrome differentiation. Out of the total patients, 55 (68.8%) survived at 28 days, while 25 (31.3%) succumbed to the illness, indicating a mortality rate of nearly one-third in the study population. Regarding Traditional Chinese Medicine (TCM) syndrome classification, Toxin-Heat Syndrome was the most commonly observed pattern, identified in 28 patients (35%), followed by Blood Stasis Syndrome in 22 patients (27.5%). Acute Deficiency Syndrome and Bowel Qi Obstruction Syndrome were each reported in 15 patients (18.8%). The predominance of Toxin-Heat and Blood Stasis syndromes suggests that inflammatory and circulatory pathological patterns were more frequent in this cohort, which may have implications for prognosis and therapeutic stratification in relation to 28-day survival outcomes.

Table 5: Clinical Outcomes and 28-Day Survival (N = 80)

Outcome	Frequency (n)	Percentage (%)
Survival	55	68.8
Death	25	31.3
TCM Syndrome Differentiation		
Toxin-Heat Syndrome	28	35
Acute Deficiency Syndrome	15	18.8
Blood Stasis Syndrome	22	27.5
Bowel Qi Obstruction Syndrome	15	18.8

Discussion

The current study assessed 80 patients who suffered from severe sepsis and found that most patients were middle-aged or elderly, while men slightly outnumbered women and patients had multiple health conditions and showed signs of respiratory infections and demonstrated serious inflammatory and coagulation problems, which resulted in a 28-day death rate of 31.2%. The findings of this study demonstrate a strong connection to current epidemiological research which studies sepsis. The higher percentage of male patients who participated in our study matches the results from the extensive multicenter study conducted by Sakr et al. (2013) [9] which found that 59.5% of severe sepsis cases involved male patients who demonstrated different immune responses based on their gender. The unadjusted data showed that females experienced worse outcomes than males but multivariable analysis proved that gender did not function as a separate predictor of outcomes which matched the results from Sakr et al. (2013) study which found minimal sex-based differences in mortality that varied among different groups".

The study results show that the age distribution shows maximum representation from the 41 to 60

age group together with a significant number of participants who belong to the 60 and above age category which confirms that older adults experience increased vulnerability to sepsis. The process of growing older brings about three changes which include immune system decline and increased health issues and reduced bodily strength, which all lead to worse health results. The Sepsis-3 task force led by Mervyn Shankar-Hari emphasized that septic shock, particularly in older patients, carries significantly elevated mortality due to profound circulatory and metabolic derangements (Shankar-Hari et al., 2016) [10]. The study found that patients with septic shock showed higher death rates which proved to be the most important factor for predicting their outcomes. The reported death rates from septic shock which range between 40 and 50 percent match the high death rates that our research found in shock patients.

The study found that most patients had multiple health conditions but the most common ones were hypertension and diabetes mellitus which showed that people with these chronic cardiovascular and metabolic diseases had higher risk of developing sepsis. The results of this study match the findings of Zheng et al. (2022) [11] who studied 674 hospitalized sepsis patients and discovered that both cardiovascular disease and diabetes served as common background conditions which raised the risk of death within 28 days. The sepsis process gets worsened by these disorders because their chronic systemic inflammation leads to endothelial dysfunction and results in microvascular damage which causes organ failure. The study identified chronic kidney disease and COPD as less common conditions that increased risk because they weakened host defense systems and decreased organ capacity.

The worldwide epidemiological patterns show that respiratory tract infections represent the main cause of sepsis which affected almost 50 percent of our study participants. The study conducted by Mikkelsen et al. (2013) [12] showed that emergency departments treated pulmonary infections as the most common reason for severe sepsis cases which resulted in patients developing acute respiratory distress syndrome (ARDS). The research conducted by Woon Young Kim and Hong (2016) [13] demonstrated that sepsis and ARDS share a direct pathophysiological relationship which leads to a 20% to 50% mortality rate among patients who develop both conditions. The high rate of respiratory infections in our study group explains the high mortality rate which especially affects patients who develop shock or respiratory failure.

Our research found that inflammatory biomarkers showed increased CRP and procalcitonin levels which were accompanied by leukocytosis that had neutrophilia and lymphopenia. The findings support the meta-analysis by Ming Tan et al. (2019) [14] which established CRP and procalcitonin as valuable diagnostic and prognostic markers in sepsis because higher levels of these markers correlated with increased severity and mortality. The analysis revealed that CRP could predict adverse outcomes to some extent which proves its value as an economical prognosis tool that can be used in areas with limited resources.

The study found that patients exhibited major coagulation disorders which resulted in extended PT and APTT testing times and showed increased D-dimer and fibrinogen test results which demonstrated active coagulation cascade operation. The research findings match the complete review by Alexandros G. Tsantes et al. (2023) [15] which showed that sepsis-induced coagulopathy exists as a spectrum starting from hypercoagulability and ending with complete disseminated intravascular coagulation. The study by Levi and Meijers (2011) [16] showed that elevated fibrinogen continues to be present through active consumption because it functions as an acute-phase reactant. The blood disorders which we discovered in our patients resulted in microvascular thrombosis and organ failure, which eventually led to their death.

The overall 28-day survival rate of 68.8% in our cohort, corresponding to a mortality of 31.2%, falls within the widely reported range of 25–30% for sepsis and approaches the higher spectrum when septic shock predominates (Shankar-Hari et al., 2016; Zheng et al., 2022). The different results which people observe stem from changes in their initial health conditions together with their infection origins and the speed at which medical treatment starts and the different methods of medical assistance they receive.

The research results demonstrate that sepsis outcomes depend on multiple factors which include age, comorbidity burden, infection source particularly pulmonary, septic shock severity, systemic inflammatory response, and coagulation disorders. The external validity of our results is demonstrated through their agreement with previous large studies and mechanistic research. The combined clinical and laboratory assessment allows for the early identification of high-risk patients which is essential to optimize management strategies and increase survival rates in this high-risk population.

Conclusion

This retrospective review of as 80 sepsis patients highlights the complex interplay of demographic, clinical, and laboratory factors in determining outcomes. The study demonstrates that middle-aged and elderly patients, particularly those with comorbidities such as hypertension and diabetes, are at higher risk of adverse outcomes. Respiratory tract infections were the most frequent source of sepsis, contributing to disease severity and mortality. Laboratory findings revealed significant systemic

inflammation, hematological alterations, and coagulation abnormalities, all of which correlated with clinical deterioration. Traditional Chinese Medicine syndrome patterns, notably Toxin-Heat and Blood Stasis, reflected the predominance of inflammatory and circulatory dysfunction. Overall, the 28-day survival of 68.8% underscores that early recognition, risk stratification, and timely interventions targeting these prognostic determinants are critical for improving outcomes in hospitalized sepsis patients.

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