ORIGINAL RESEARCH

Spectrum, treatment and outcome of sepsis at an Indian tertiary hospital: Clinical and microbiological characterization

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ABSTRACT

Background: More than 50% of hospital deaths are caused by community-acquired sepsis, a fatal systemic reaction. It is possible to greatly improve patient outcomes and cut costs by having a better understanding of disease states, progression, severity, and clinical signs, including microbiological characteristics. **Objective:** Evaluation of community-acquired sepsis outcomes and microbiological traits in patients admitted to tertiary care facilities is the goal. **Methods:** Over the course of a year, a retrospective, observational cohort analysis of all adult patients who were hospitalised for community-acquired sepsis was conducted. Patients who met the inclusion criteria provided clinical and microbiological data. Utilising the culture approach, the microbial properties of each sepsis were examined, and the responsible bacteria was discovered. Mortality from all causes in hospitals was the main result. The length of stay (LOS) and admission to the intensive care unit (ICU) were secondary outcomes. **Results:** We looked at 107 sepsis patients' data, of which 38.3% had sepsis, 32.7% had severe sepsis, and 29% had septic shock. 214 people. The included patients' median age was 55.6± 21.5 years, and 54% of them were female. Abdominal (24.3%) and genitourinary (28%) infections were the most common sources of infections. Atherosclerosis (61.7%), chronic heart disease (45.8%), and diabetes mellitus (31.8%) were the three concomitant illnesses with the highest prevalence. E. coli was the most common pathogen among gram-negative bacteria, followed by K. pneumoniae (5.6%) and S. enteritidis (4.7%). The most common infections among gramme positive patients were S. pneumoniae (8.4%), S. aureus (6.5%), and S. pyogenes (3.7%). Mortality in hospitals was high (14.0%). **Conclusion:** Sepsis acquired in the community carries a heavy illness burden with distinctive sources and causal agents. The underlying factors particularly microbiological characteristics assessment may help for guiding treatment strategies.

Keywords: Sepsis, Tertiary care, Microbiological features, Clinical outcomes

INTRODUCTION

In low- and middle-income nations, infectious diseases continue to be a major cause of morbidity and mortality [1]. Sepsis is one of the infectious diseases that has received more attention in the last five years than it did in the previous ten. Sepsis is an infection-related dysregulated host response that can result in systemic inflammation, organ failure, or even death [2].Sepsis diagnosis and prognosis now follow new standards. In order to get quick and accurate results, microbiological knowledge has been developed. For the first time, sepsis is receiving more attention in the media and there is growing evidence of improved initial resuscitation techniques [3].

Sepsis is brought on by infection, and understanding the type of organism that is causing the infection is important for both epidemiology and choosing the best course of treatment with antibiotics [4]. Diagnostic progress aside, there is still a lot of variability in epidemiology. Numerous variables play a role, including inadequately categorized records of various infectious pathologies and the concept of sepsis in a particular way, as well as a lack of information at both the global and specific levels [5,6]. The majority of studies are retrospective, they make use of discharge report coding, and as a result, there is a lot of variation depending on who does the classification. Sepsis must be diagnosed through laboratory testing in order to be distinguished from other diseases and to assess and track organ function, blood oxygenation, and acid-base balance.

Sepsis mortality is still quite high [7] despite earlier detection and improvements in clinical methods like sepsis-focused critical care support. Because sepsis continues to be one of the top causes of death in patients with infectious infections, it has been deemed a medical priority by the World Health Assembly, the World Health Organisation, and the Centres for Disease Control and Prevention (CDC) [8].The role of laboratory hematological, biochemical, and microbiological tests is crucial in the diagnosis of sepsis. A lot of work has been done recently to identify biomarkers that will enable early diagnosis of this disease because culture-based diagnosis is slow. In general, inflammatory markers are being researched in the hopes that they will be able to supplement or replace currently used markers like procalcitonin (PCT) and C-reactive protein (CRP). There are numerous studies looking for the ideal biomarker, but they are moving slowly [9]. Use of the SOFA score [Sequential (Sepsis-Related) Organ Failure Assessment] is currently advised for diagnosing both sepsis and septic shock. The SOFA system is an easy-to-use tool that can be used to detect dysfunction or failure of the major organs as a result of sepsis [10].

It must be assumed that a significant number of cases go unrecognized and unreported because diagnostic criteria for sepsis recognition and prognostic evaluation are frequently not consistently applied in clinical practice. As a result, the interventions and research focusing on sepsis treatment do not address the full scope of the issue and may not be enough to address the issue of a high sepsis mortality rate alone. The onset of community-acquired sepsis (CAS) in a patient without previously recorded linkages to healthcare facilities or modalities occurs 48–72 hours following hospital admission. Seven out of ten patients have chronic conditions, and the CDC's statistics indicates that 80% of sepsis cases begin outside of hospitals [8]. More recent statistics regarding CAS, especially among Hungarian patients, are needed [11-13]. It is predicted that 20–40% of these septic patients admitted from the community require further treatment in an intensive care unit (ICU), and in-hospital mortality could be as high as 25–60%. Determining the epidemiological, microbiological, and clinical outcomes of CAS among adult patients hospitalised to our tertiary referral centre was our goal as a result.

MATERIALS AND METHODS

STUDY DESIGN AND POPULATION

A retrospective, observational cohort research was conducted by examining all cases of community-acquired sepsis in consecutive adult patients (age 18 at diagnosis) admitted to tertiary care hospitals for the previous two years. For patients with infectious disorders and those seeking treatment and admission for the management of sepsis, our tertiary care centre provides an in-patient and out-patient facility. The institutional ethical board accepted the study protocol, which complied with the Helsinki Declaration and other international ethical standards. Since this is a retrospective study, informed consent is not necessary.

PATIENT IDENTIFICATION AND INCLUSION

Any patient who received a sepsis diagnosis at our centre during the study period qualified for inclusion. By looking for admission and discharge diagnoses that were consistent with sepsis, severe sepsis, or septic shock as defined by the International Classification of Diseases (ICD-10) in the hospital's electronic database, patients were identified. All prospective cases were manually assessed to avoid selection bias. Patients were included if they were admitted with signs and symptoms suggestive of infection, if their case met the criteria for SIRS-based sepsis, and if sepsis began or was diagnosed within 72 hours of admission or if they were transported from another hospital or the community to our centre within this time frame due to CAS.

PATIENT EXCLUSION

onset or diagnosis > 72 h from admittance, 2) sepsis due to nosocomial infection during hospital stay, 3) hospitalisation at any healthcare facility for 72 h, systemic antimicrobial treatment, or cavity-opening surgery within 90 days prior to admission, 4) routine outpatient visits (i.v. therapy or chemotherapy, chronic wound care, hemodialysis), within 30 days prior to admission, 5) long-term care facility residence for 3 days,6) healthcare worker, 7) data inaccessible through the hospital electronic database.

DEFINITIONS

At the hospital's Central Microbiology Laboratory, tests for microorganisms were conducted. The SIRS-based adult criteria of the American College of Chest Physicians/Society of Critical Care Medicine [2] were used to identify sepsis, severe sepsis, and septic shock. Before the introduction of antipyretics or antimicrobials, a fever was defined as a single tympanic temperature of 38.0 °C or higher.Escalation was defined as the process of changing or switching the empirical antimicrobial choice in order to widen the antibacterial range while waiting for microbiological results. After acknowledging the results of the microbiological tests, targeted antibiotic therapy was described as the continuance or narrowing of the empirical regime (de-escalation).

DATA COLLECTION, FOLLOW-UP AND PATIENT OUTCOMES

The following information was gathered: 1) age, gender, and known comorbidities at diagnosis; 2) sepsis progression (onset time, severity, and source of sepsis; symptoms and outcomes of physical examination at diagnosis); 3) laboratory findings at diagnosis; 4) microbiological findings; 5)

characteristics of antimicrobial and supportive therapies; and 6) patient outcomes. Data were collected anonymously and then converted to an electronic case report template. The database was used to track patients throughout their entire hospital stay, but post-discharge monitoring wasn't done.
Secondary outcomes included ICU admission, length of stay (LOS and ICU LOS), source control, and bacteraemia rates. In-hospital all-cause mortality was the primary objective. The traits of the causing agents, the origins of sepsis, and the types and durations of supportive and antibiotic therapy were also assessed.

RESULTS

DEMOGRAPHIC CHARACTERISTICS

Table 1 displays demographic and clinical information. 265 suitable instances were found to be during the study period, and 107 (40.4%) of these were included in our study. Based on the severity of the sepsis, we divided these patients into three groups: 29% (31/107) with septic shock, 32.7% (35/107) with severe sepsis, and 38.3% (41/107) with sepsis. 18.6% (20/107) of the cohort's patients were under 75 years old, and the gender distribution was equal. The three comorbid conditions with the highest prevalence were diabetes mellitus (34/107, 31.8%), chronic heart disease (49/107, 45.8%), and arterial hypertension (66/107, 61.7%). Regardless of the severity of the sepsis, the abdominal (26/107, 24.3%) and urogenital (30/107, 28%) were the most common sources of the condition. Furthermore, the use of corticosteroids was commonly linked to severe sepsis.Leading symptoms at onset were fever (94/107, 87.8%), hypotension (60/107, 56.1%), and tachycardia (64/107, 59.8%).

Table 1: Baseline characteristics of sepsis

Parameters	Total (*n* = 107)	Sepsis (*n* =41)	Severe sepsis (*n* = 35)	Septic shock (*n* = 31)
Age (years ± IQR)	55.6 ± 21.5	56.8 ± 18.9	53.6 ± 16.9	57.2 ± 25.1
Male gender	46 (43.0)	16 (37.3)	17 (48.6)	13 (44.3)
Comorbidities:				
Arterial hypertension	66 (61.7)	25 (61.4)	22 (62.9)	18 (60.7)
Chronic heart disease	49 (45.8)	15 (36.1)	17 (48.6)	15 (49.2)
Chronic lung disease	17 (15.9)	6 (13.3)	6 (17.1)	6 (18.0)
Chronic kidney disease	25 (23.4)	7 (18.1)	10 (30.0)	7 (23.0)
Chronic liver disease	27 (25.7)	7 (15.7)	10(30.0)	10 (34.4)
Diabetes mellitus	34 (31.8)	12 (28.9)	12 (34.3)	7 (21.3)
Malignancy	11 (10.3)	6 (13.3)	3 (8.6)	2 (8.2)
Chronic corticosteroid use	9 (7.9)	1 (2.4)	6 (15.7)	2 (6.6)
Immunosuppression	29 (26.6)	9 (21.7)	12 (34.3)	8 (24.6)
Cerebrovascular disease	29 (27.1)	11 (26.5)	6 (18.6)	11 (37.7)
Intravenous drug use	4 (3.3)	1 (2.4)	2 (5.7)	1 (3.2)
Excess alcohol use	22 (21.0)	6 (15.7)	6 (18.6)	10(31.1)
Source of sepsis:				
Head or neck source	15 (13.6)	6 (15.7)	5 (14.3)	3 (9.8)
Meningitis	12 (11.2)	5 (12.0)	4 (11.4)	3 (9.8)
Tonsillopharyngitis	2 (1.9)	2 (3.6)	1 (2.8)	0
Otitis media	1 (1)	0	1 (2.8)	0
Thoracic source	15 (14.0)	6 (13.3)	5 (14.3)	5 (14.8)
Abdominal source	26 (24.3)	6 (15.7)	8 (22.9)	11 (37.7)
Peritonitis	6 (5.6)	1 (2.4)	1 (2.8)	5 (14.8)
Colonic perforation	1 (0.9)	0	0	1 (3.3)
Oesophagitis	1 (0.5)	1 (1.2)	0	0
Enterocolitis	9 (8.4)	3 (6.0)	4 (10.0)	3 (9.8)
Skin and soft tissue	10 (9.3)	4 (9.6)	3 (7.1)	4 (11.5)
Urogenital source	30 (28)	13(31.3)	9 (25.7)	4 (14.8)
Toxic shock syndrome	3 (2.8)	0	1 (2.9)	2 (6.6)
Unknown source	12 (11.2)	6 (14.5)	4 (12.9)	1 (4.9)
Signs of sepsis:				
Fever	96 (89.7)	37 (89.2)	33 (94.3)	26 (85.2)
Hypothermia	1 (0.9)	0	1 (2.9)	0
Euthermia	10 (9.8)	5(10.8)	2 (4.3)	5 (14.8)
Hypotension	60 (56.1)	14 (32.5)	23 (67.1)	30 (100.0)
Tachycardia	64 (59.8)	16 (39.8)	23 (65.7)	28 (91.8)
Tachypnea	45 (42.1)	8 (19.3)	18 (51.4)	19 (62.3)
Bleeding	9(8.4)	2 (3.6)	2 (4.3)	6 (19.7)

Skin lesion	28 (26.2)	8 (19.3)	8 (22.9)	12 (39.3)
Peripheral oedema	20 (19.2)	5 (12.0)	6 (18.6)	9 (29.5)
Splenomegaly	25 (23.4)	8 (19.3)	8 (24.3)	8 (27.9)

MICROBIOLOGICAL CHARACTERISTICS OF SEPSIS

Table 2 lists the features of microbes. Patient blood cultures were obtained. Other pertinent samples were also taken from certain patients, and non-culture-based diagnostic techniques were used. The cohort showed a predominance of Gramme negative bacilli, with E. coli (30/107, 28.0%) being the most prevalent pathogen and K. pneumoniae (6/107, 5.6%) and S. enteritidis (5/107, 4.7%) following closely behind. S. pneumoniae (9/107, 8.4%), S. aureus (7/107, 6.5%), and S. pyogenes (4/107, 3.7%) were the most frequently found Gramme positive pathogens. When sepsis was polymicrobial, the etiological agent could not be determined in certain individuals. There were no statistically significant variations between the severity classes in the frequencies of the causing agents. The most frequent pathogen found in infections of the head, neck, and thorax was S. pneumoniae, followed by E. coli and S. aureus in infections of the abdomen and genitourinary system.

In our group, the in-hospital overall death rate was 14.0% (15/107), and 41 (383%) patients needed to be admitted to the intensive care unit. The statistical likelihood of both outcomes was higher in septic shock cases.Regardless of the severity of the sepsis, the median length of stay and the length of the antibiotic therapy were both greater than one week.

Table 2: Microorganisms identified as causative agents in adult patients with community-acquired sepsis by severity group

Parameters	Total (n = 107)	Sepsis (n =41)	Severe sepsis (n = 35)	Septic shock (n = 31)
E. coli	30 (28.0)	12 (30.1)	10 (30.0)	8 (23.0)
S. pneumoniae	9 (8.4)	2 (4.8)	3 (8.6)	4 (13.1)
S. aureus	7 (6.5)	3 (8.4)	2 (4.3)	2 (6.6)
K. pneumoniae	6 (5.6)	1 (2.4)	2 (7.1)	3 (8.2)
S. Enteritidis	5 (4.7)	1 (2.4)	3 (7.1)	1 (4.9)
S. pyogenes	4 (3.7)	1 (2.4)	2 (4.3)	1 (4.9)
N. meningitidis	3 (2.8)	1 (2.4)	1 (2.8)	1 (1.6)
L. monocytogenes	3 (2.8)	1 (1.2)	1 (2.8)	1 (1.6)
K. oxytoca	3 (2.8)	0	1 (2.8)	2 (3.3)
P. mirabilis	3 (2.8)	0	2 (4.8)	1 (1.6)
S. anginosus	3 (2.8)	0	1 (2.8)	1 (1.6)
C. jejuni	3 (2.8)	1 (2.4)	0	2 (3.3)
L. pneumophila	2 (1.9)	0	1 (2.8)	1 (1.6)
S. agalactiae	2 (1.9)	0	2 (4.8)	0
F. necrophorum	2 (1.9)	0	2 (4.8)	0
West Nile virus	2 (1.9)	0	2 (4.8)	0
S. mitis	2 (1.9)	0	2 (4.8)	0
S. dysgalactiae	2 (1.9)	1 (2.4)	1 (2.8)	0
C. difficile	2 (1.9)	1 (2.4)	0	1 (3.2)
P. aeruginosa	2 (1.9)	0	1 (2.8)	1 (3.2)
B. thetaiotamicron	1 (0.9)	0	0	1 (3.2)
C. albicans	1 (0.9)	1 (2.4)	0	0
C. canimorsus	1 (0.9)	0	0	1 (3.2)
E. cloaceae	1 (0.9)	1 (2.4)	0	0
P. multocida	1 (0.9)	1 (2.4)	0	0

ANTIMICROBIAL AND SUPPORTIVE THERAPIES

In these individuals, supportive and antimicrobial therapy characteristics were assessed. Ceftriaxone was the empirical antibacterial agent that was used the most, followed by levofloxacin and vancomycin. Septic shock patients preferred taking two or three antimicrobials together. When compared to severe sepsis and sepsis, respectively, penicillins for sepsis and carbapenems for septic shock were given in much larger percentages. The interval between the onset of the first symptoms suggestive of CAS and the administration of the first antibiotic was 3.5±3.1 (1-6) days. In 90 out of 107 patients (84.1%), empirical antibiotic therapy was deemed sufficient; 20 patients (18.6%) required escalation. With ceftriaxone as the recommended antibiotic, de-escalation of initial therapy was carried out in 15 patients (15%), the majority of whom were in septic shock. In 44 patients (41%), intravenous medicine was switched to an oral substitute, usually ciprofloxacin, cefuroxime, or cefixime. Antimicrobial treatment lasted 12.5±6.2 (1-

45) days. In 55 cases (51.5%), predominantly in individuals with septic shock, supportive care was required. The most often used vasopressors were noradrenaline, dopamine, and terlipressin.

DISCUSSION

We examined the clinical, microbiological, and prognostic factors of community-acquired sepsis (CAS) in adult patients admitted to a single national centre over the course of a year in this retrospective observational cohort study. The majority of cases (66/107, 61.7%) were caused by severe sepsis and septic shock. Older patients typically received treatment for diabetes mellitus, chronic cardiac illnesses, or other types of immunosuppression. The demographics and the burden of chronic diseases are comparable, increasing the total vulnerability for CAS, as shown by a number of earlier research [14,15]. In a cohort of 970 septic adults, Wang et al. reported that 52.4% of patients were male and 81.0% of patients were under the age of 60 [14]. Similar to this, there was a modest (53.2%) male dominance in the earlier investigation by Nygrd et al., with 65.5% of the patients being under 60 years old [16].

Due to the patients' generally poor functional condition, cerebrovascular and chronic liver illness were linked to septic shock. In a case-control study that looked at data from 1713 septic patients, Henriksen et al. [17] identified chronic illnesses, most frequently cardiopulmonary and renal diseases, diabetes mellitus, cancer, immunosuppression, and alcoholism-related conditions as independent risk factors for hospitalisation due to CAS. There was a minor tendency for female domination in the cohort when demographic data were taken into account.

Some clinical and microbiological traits could be indicative of CAS. In about half of the cases, an abdominal or urogenital infection was the cause, and abdominal infections were more likely to proceed to septic shock. According to the latter, attending clinicians should be extra attentive to patients who have intra-abdominal sepsis and should strongly assume an abdominal source in cases of septic shock without a clear focal point. Although greater body temperatures were frequently observed, the severity of sepsis was not correlated with fever. We should point out that E. coli, S. aureus, and S. pneumoniae accounted for 43% (46/107) of the cases. According to numerous researchers, E. coli accounts for 25–30% of cases and is the most common isolated organism, followed by S. aureus, S. pneumoniae, and K. pneumoniae, and then other species of Streptococci and Gramme negative bacteria [18].

CONCLUSION

In our study, it was discovered that CAS was a common condition with recognisable causes and known pathogenic organisms. When choosing empirical therapy, a sparing strategy with broader spectrum antibiotics can be taken into account because a significant part of cases was brought on by one of three major bacteria. Although patients at higher risk for a bad result might be identified earlier by contributing variables, in-hospital mortality was high in severe instances. It is necessary to conduct microbial culture assessment for guiding treatment strategies.

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