CLINICAL AND PARACLINICAL STUDY OF SEPSIS

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Abstract

The difficulty in the diagnosis of sepsis comes in knowing when a localized infection has become systemic. We tried to establish which are the more suggestive clinical signs of sepsis, consulting the pathology admitted in the Clinical Section of Infectious Diseases Oradea.

In our study, 27% of infections are confirmed as Gram negative, 25% Gram positive, 20% mixed Gram positive/Gram negative, and 3% fungal. From the Gram negative, the organisms are: Leptospira – (15%), Neisseria meningitidis – (7%), Klebsiellla/Citrobacter – (5%), Proteus – (5%); Pseudomonas – (3%), Salmonella – (3%), Candida – (3%), and 31% of cases had unidentified etiology. The elder persons predominated, 28 cases (52%), followed by middle aged persons, 20 cases (37%). The total case fatality rate (CFR) was 16%. 8 patients with sepsis died, 6 patients (12%) cause of severe sepsis, 2 patients (4%) cause of septic shock. Medical illness is one of the major predisposing factors in the development of sepsis.

Key words: systemic inflammatory response, severe sepsis, septic shock.

INTRODUCTION

The modern concept of sepsis is that the host's immune response to the infection causes most of the symptoms of sepsis, resulting in hemodynamic consequences and damage to organs. Systemic inflammatory response syndrome (SIRS) is a term that was developed in an attempt to describe the clinical manifestations that result from the systemic response to infection. Criteria for SIRS are considered to be met if at least 2 of the following 4 clinical findings are present:

a. Temperature greater than 38°C (100.4°F) or less than 36°C (96.8°F);
b. Heart rate (HR) greater than 90 beats per minute (bpm);
c. Respiratory rate (RR) greater than 20 breaths per minute or arterial carbon dioxide tension ($PaCO_2$) lower than 32 mm Hg;
d. White blood cell count (WBC) higher than 12,000/µL or lower than 4000/µL, or 10% immature (band) forms.

Sepsis is defined as the presence of infection in association with SIRS. The presence of SIRS is, of course, not limited to sepsis, but in the presence of infection, an increase in the number of SIRS criteria observed should alert the clinician to the possibility of endothelial dysfunction, developing organ dysfunction, and the need for aggressive therapy.

Bacteremia is defined as the presence of viable bacteria within the blood. It may be primary (without an identifiable focus of infection) or, more often, secondary (with an intravascular or extravascular focus of infection). Although sepsis is commonly associated with bacterial infection, bacteremia is not a necessary ingredient in the activation of the inflammatory response that results in severe sepsis. In fact, septic shock is associated with culture-positive bacteremia in only 30-50% of cases.

Multiple organ dysfunction syndrome (MODS) is defined as the presence of altered organ function in a patient who is acutely ill and in whom homeostasis cannot be maintained without intervention.

MATERIAL AND METHODS

This is a hospital based study conducted from Jan 2009 to Dec 2010 (two years) in the Clinic of Infectious Diseases Oradea, Bihor county. A separate proforma was filled for each case entered into the study. The demographic and data about clinical features and laboratory results of the cases were included in each proforma.

The clinical forms of the disease were classified. The pathological functional parameters for each organ and system were taken into consideration. Complications (from simple affectation of an organ, to organ insufficiency) have been noted. Clinical picture has been correlated with the etiology of infections.

Paraclinical investigations were interpreted in order to fundament the diagnosis of sepsis and the gravity of septic syndrome.

RESULTS AND DISCUSSIONS

A total number of 54 patients fulfilled the criteria of sepsis, 27 patients were interpreted as severe sepsis (46%), and 10 patients had septic shock (19%).

The mean age ± SD of the patients under this study was 42.73 ± 11.7 years (16 – 70) and males outnumbered the females 33 (61%) vs. 21 (39%).

The elder persons predominated, 28 cases (52%), followed by middle aged persons, 20 cases (37%). Elderly patients experience a marked decline in cell-mediated immune function and reduced humoral immune function.

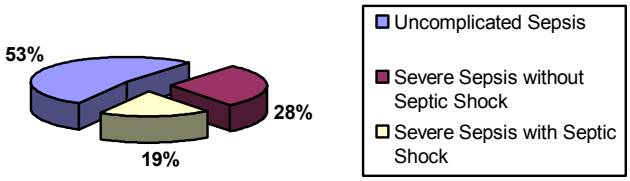

Fig 1 Classification of Sepsis Cases

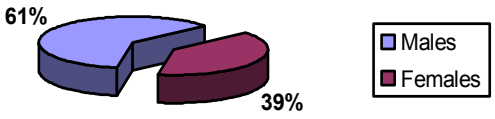

Fig. 2 Classification of Sepsis by Gender

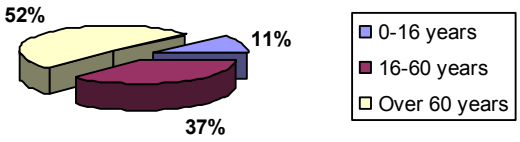

Fig. 3 Classification of Sepsis by Age

Age-dependent defects in T and B cell function are demonstrable in elderly patients. The cytokine and chemokine signaling networks are altered in elderly patients and tends to favor a type 2 cytokine response over type 1 cytokine responses.

The induction of proinflammatory cytokines after septic stimuli is not adequately controlled by anti-inflammatory mechanisms in elderly persons.

This immune dysregulation is accompanied by a more pronounced procoagulant state in older patients. These molecular events function in concert to render elderly patients at excess risk for mortality from severe sepsis and septic shock.

The total case fatality rate (CFR) was 16%. Overall, 8 patients with sepsis succumbed to death, 6 patients (12%) died cause of severe sepsis, and 2 patients (4%) died cause of septic shock.

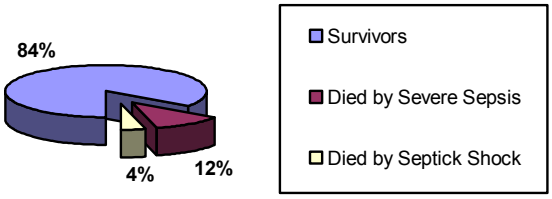

Fig. 4 Mortality in Sepsis

The pathophysiology of sepsis is complex and results from the effects of circulating bacterial products, mediated by cytokine release, caused by sustained bacteremia.

Cytokines, previously termed endotoxins, are responsible for the clinically observable effects of the bacteremia in the host. Impaired pulmonary, hepatic, or renal function may result from excessive cytokine release during the septic process.

We have made a classification of cases with sepsis by causes, even in a part of these primary infectious (15%), the source was not identified.

Different clinical conditions associated with sepsis are inducing circumstances for the increasment of fever, some of them are causing high fever, over 39°C.

Table 1

Fever in Diseases and Clinical Conditions Associated With Sepsis

Fever ≥39°C	***Fever ≤39°C***
Gastrointestinal tract source Liver Gallbladder Colon Abscess Intestinal obstruction Instrumentation	**Gastrointestinal tract source** Esophagitis Gastritis Pancreatitis Small bowel disorders GI bleeding
Genitourinary tract source Pyelonephritis Intra-/perinephric abscess Renal calculi Urinary tract obstruction Acute prostatitis/abscess Renal insufficiency Instrumentation in patients with bacteriuria	**Genitourinary tract source** Urethritis Cystitis Cervicitis, Vaginitis Catheter-associated bacteriuria (in otherwise healthy hosts without genitourinary tract disease)
Pelvic source Peritonitis Abscess	**Upper respiratory tract source** Pharyngitis Sinusitis Bronchitis Otitis
Lower respiratory tract source Community-acquired pneumonia (with asplenia) Empyema Lung abscess	**Lower respiratory tract source** Community-acquired pneumonia (in an otherwise healthy host)
Intravascular source Intravenous-line sepsis Infected prosthetic device	**Skin/soft-tissue source** Osteomyelitis Uncomplicated wound infections
Cardiovascular source Acute bacterial endocarditis Myocardial/perivalvular ring abscess	**Cardiovascular source** Subacute bacterial endocarditis
	Central nervous system source Bacterial meningitis

The identified source of sepsis were: pneumonia 13 cases (24%), bacterial meningitis 10 cases (19%), leptospirosis 8 cases (15%), urosepsis 5 cases (9%), meningococcemia 4 cases (7%), and salmonellosis 2 cases (4%). In our study 35 patients (65%) had leukocytosis, 5 patients (9%) had a normal value of leukocytes, and 14 patients (26%) had leukopenia.

We obtained blood cultures in all patients upon admission to demonstrate the organism responsible for infection. Negative blood culture results are also necessary to include pseudosepsis in the differential diagnosis. In our study 27% of infections were confirmed Gram negative,

25% Gram positive, 20% mixed Gram positive/Gram negative, and 3% fungal.

From the Gram negative bacteriae, the organisms in order are: *Leptospira* spp. – (15%), *Neisseria meningitidis* – (7%), *Klebsiellla/Citrobacter* – (5%), *Proteus* – (5%); *Pseudomonas* – (3%), *Salmonella* spp. – (3%), and the remaining 31% is made up of different unidentified bacteriae.

Of the Gram positive infections, the most common is *Streptococcus pneumoniae* (18%), followed by *Staphylococcus aureus* (13%). The fungal infections were candidal – 2 cases (3%).

Table 2

Etiology of Sepsis

Etiological Agent	***Number of cases***	***Percent***
S. pneumoniae	10	18%
Leptospira spp.	8	15%
Staphylococcus aureus	7	13%
Neisseria meningitidis	4	7%
Klebsiella	3	5%
Proteus	3	5%
Pseudomonas aeruginosa	2	3%
Salmonella spp.	2	3%
Unidentified Agents	15	31%

Medical illness is one of the major predisposing factors in the development of sepsis. If the prevalence of comorbidities is examined in a septic population, it is clear that certain types of organ dysfunction – including COPD, congestive heart failure, diabetes mellitus, and cancer – predispose an individual to the development of sepsis.

Not all septic patients have evidence of bacteremia, but there are specific comorbidities associated with bacteremia in the setting of sepsis, such as liver dysfunction, total parenteral nutrition, and an indwelling urinary or venous catheter. The respiratory and genitourinary systems combined are the source in 65% of patients with sepsis aged ≥65 years, vs only 49% in those younger than 65. In comparison, younger patients are at higher risk of GI sources (15%) and skin, bone, and soft tissue sources (6%) compared with older adults.

The risk of developing septic shock can be minimized through treatment of underlying bacterial infections, and prompt attention to signs of bacteremia. In the hospital, scrupulous aseptic technique on the part of medical professionals lowers the risk of introducing bacteria into the bloodstream.

CONCLUSIONS

1. From Jan 2009 to Dec 2010, a total number of 54 patients fulfilled the criteria of sepsis, and were admitted in the Clinic of Infectious Diseases Oradea, Bihor county; 27 patients were interpreted as severe sepsis (46%), and 10 patients had septic shock (19%).
2. The mean age ± SD of the patients under this study was 42.73 ± 11.7 years (16 – 70) and males outnumbered the females (33 cases – 61% vs. 21 cases – 39%). The elder persons predominated – 28 cases (52%), followed by middle aged persons – 20 cases (37%).
3. The total case fatality rate was 16%. Overall, 8 patients with sepsis succumbed to death, 6 patients (12%) died cause of severe sepsis, and 2 patients (4%) died cause of septic shock.
4. Primary infections in patients with sepsis were pneumonia or bronchopneumonia – 13 cases (24%), leptospirosis – 8 cases (15%), urosepsis – 5 cases (9%), and meningococcemia – 4 cases (7%).
5. Leukocytosis was found in 35 patients with sepsis (65%), 5 patients (9%) had a normal value of leukocytes, and 14 patients (26%) had leukopenia.
6. 27% of infections were confirmed as Gram negative, 25% Gram positive, 20% mixed Gram positive/Gram negative, and 3% fungal.
7. Particularly bacteria were identified in our study, concerning the etiology of sepsis: *Streptococcus pneumoniae* – 10 cases (18%), *Leptospira spp.*– 8 cases (15%), *Staphylococcus aureus* – 7 cases (13%), and *Neisseria meningitidis* – 4 cases (7%). Unidentified agents were in 15 cases (31%). Two cases (3%) had infections with *Candida*.
8. The respiratory and genitourinary systems combined are the source in 65% of patients with sepsis aged ≥65 years, vs only 49% in those younger than 65. In comparison, younger patients are at higher risk of gastro-intestinal sources (15%) and skin, bone, and soft tissue sources (6%) compared with older adults.
9. Septic shock is a severe complication of sepsis. In our study, 10 patients had septic shock (19%), and 2 patients (4%) died due to this cause.
10. Medical illness is one of the major predisposing factors in the development of sepsis.

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