

A Brief Review on Septicaemia

Dr. Lipika jena¹, dr. Rajashree panigrahy², dr. Nandita sharma³, dr. Purabi baral⁴, dr. Santosh singh⁵

¹²³⁴Department of Microbiology

⁵Department of Medicine

IMS & SUM Hospital, Siksha "O" Anusandhan University (Deemed to be), K8

Kalinga Nagar, Bhubaneswar-751003, Odisha, India

¹lipikajena.jena07@gmail.com

²dr.rajashreep@gmail.com

³dr.nandita.s@gmail.com

⁴drpurabibaral@gmail.com

⁵drsantoshsingh.singh80@gmail.com

Abstract:

Sepsis is among the major reason of death in hospitalized patients. The hallmarks of sepsis are excessive inflammation, coagulation, and the suppression of fibrinolysis. It requires prompt diagnosis, immediate treatment with antibiotics & hemodynamic support. The early diagnosis of sepsis with immediate treatment can prevent its progression and decrease the mortality rate. The initial antibiotic to be given must be a broad-spectrum dependent over local sensitivity patterns. It should be daily assessed for de-escalation and cessation. The management is influenced more by appropriate treatments along with the antibiotics and fluid than by the specific intensive care.

Keywords: septic shock, infectious etiology, critical care

1. INTRODUCTION:

The sepsis is a result of different complication of viral, fungal and bacterial infections and in current situations is stated as a life-threatening improper functioning of organs caused by faulty host reply to infection. Microbial infections are the principal causes of mortality worldwide, furthermore in the low as well as countries with lower-middle income. The sepsis like syndrome may cause by any of the parasitic, bacterial, fungal or viral infections and is often confused by the non-infectious etiologies resulting diagnosis mainly difficult in case of an inapparent infectious source[1]. The research found that while illness mortality has declined over the last 30 years, death remains a significant cause and is the leading cause for disability. The main causes of mortality and morbidity is the infection in India. The key factors are accelerated urbanization, population ageing, evolving viral and bacterial diseases, along with an old upstream climate that is predisposed to problems such as deprivation, injustice and analphabetism[2][3]. One of the important causes for this is Blood stream infections (BSIs) especially in ICU patients. ICUs are a significant cause of infections especially bacterial. BSIs is of two kinds; one by the bacteria diffusion via blood from local infection (secondary BSI) and other by an identifiable infectious process (primary BSI). Including early diagnostics, prompt administration of adequate antimicrobials in bacterial infections in such cases has been shown to minimize mortality and morbidity. Antibiotics may, on the other hand, though, have several side effects, and also cause antimicrobial resistance due to uncontrolled and prolonged usage. Therefore, the quick diagnosis and etiology of sepsis is of considerable importance.

2. REVIEW OF LITERATURE

The term “Sepsis” was taken from the Greek word meaning “PUTRID”. In the 19th century, for the very first time the concept of infection as the cause of sepsis was introduced by Ignaz Philip Semmelweis & Joseph Lister. Since then term “sepsis” has been closely related to Bacterial infection.

We have to understand a few terms before we understand sepsis like SIRS (systemic inflammatory response syndrome), bacteremia, septicemia, septic shock. SIRS is an irregular generalized inflammatory response in those organs that are remote to insult & is defined as the systemic response to a wide range of stresses. Sepsis is called as the invasion of either microorganisms or their toxins or both into the blood stream along with the host response to this invasion. If SIRS occurs in a patient with proven or suspected infection, it is known as sepsis. SIRS is called sepsis in the American consensus scheme. Bacteremia is the existence of bacteria in blood, and is showed by the positive blood cultures. Septicemia is defined as a clinical syndrome; considered by fever, malaise, chills, tachycardia, prostration, toxicity and hyperventilation. Sepsis with hypotension (SBP<90 mmHg) for at least one hour despite adequate fluid resuscitation[4][5].

Sepsis accounts for more than 2, 00,000 deaths per year in US. Sepsis related incidence and mortality rate increases with age and preexisting co-morbidity. In a hospital survey discharge records, from seven states in 1995, Angus and Colleagues estimated the annual incidence of sepsis to be 300 cases per 1, 00,000 populations. The estimated crude mortality rate was 28%. The median age for patients with sepsis is approximately 60 years. A similar survey conducted in the intensive care units in US and Europe during the year 1990 and 2000, found out approximately up to 70 - 80% of cases of sepsis in people aged above 18 occurred in the individuals hospitalized for various other reasons. In 30 to 50% cases, no definite etiology was found[6].

When first introduced, sepsis was defined as the syndrome which is caused by the Gram-negative microorganisms. Recently, large epidemiological studies have been published on sepsis worldwide. In nearly two thirds and in gram-positive patients with cultivable-positive sepsis, gram-negative bacteria were identified. Gram-positive bacteria have also been shown to be weaker in Asia than elsewhere in the world because of sepsis. In addition, the prevalence of viral sepsis was generally extremely low (< 5 percent). The predominant bacteria that are causing sepsis are; *Staphylococcus aureus*, *Pseudomonas* species (spp.) and *Escherichia coli*. *Candida albicans*, the leading fungal pathogen is related through relatively high transience charges. The viral pathogens (also observed in seasonal epidemics) are influenza serotypes and dengue viruses in tropical areas. Rarely parasite infection can also cause sepsis (<1%). Infections are primarily classified into acquired populations or clinics. With contrast to community-acquired diseases, three recent studies have indicated a significant rise with Gram negative bacterial sepsis in hospital and in the ICU. Polymicrobial infections significantly are now reported more in ICU-acquired as well as hospital-acquired sepsis in two studies [7][8][9]. In recent studies done by Pittet et al, Valles et al 2009, about 50-60% BSIs were caused by gram negative organisms and 20-30% by gram positive organisms. Fungi mainly *Candida* spp contribute to 6-10% of episodes. CoNS should be reported in BSI if two or more blood culture positivity is obtained. *S.epidermidis* the most common isolate among CoNS. *Staphylococcus aureus* is one of the leading causes of nosocomial infection, most common cause of surgical wound infections and the second most common cause of primary bacteraemia next to CoNS. *E. coli* and *Klebsiella* spp are the most common cause of both community acquired and nosocomial bacteraemia. Enterobacteriaceae accounts for 17 percent of all BSI and they are second common cause of the BSI next to CoNS[10].

The risk factors & underlying conditions of BSI are immunosuppression, irrational use of antibiotics that leads to emergence of resistance to drugs, invasive procedures that allow microorganisms to enter the host, surgical procedures, underlying organ failure, Malignancy, among others[11].

The clinical features or presentation ranges from mild symptoms to fulminant sepsis leading to septic shock, DIC, high mortality and threatening complications. Fever is common presenting symptom in almost all patients. Other clinical features include increased respiratory rate, heart rate and decreased blood pressure.

Blood cultures are important diagnostic tool in patients with BSI. If there are clinical indications of BSI, blood samples must be told. The growth of bacteria can be detected by conventional and automated methods. The cells were then classified and the resistance to different antimicrobials was tested[12].

Blood cultures are obtained with aseptic precautions using sterile needle or syringe. About 5- 10 ml of the blood should be drawn aseptically by single venepuncture, inoculated into blood culture bottle containing medium and incubated. After 18-24 hours of incubation the bottles are checked for presence of microorganisms. Proper aseptic measures should be followed while collecting samples of blood as there is increased incidence of bacteraemia from normal skin flora like the Coagulase Negative *Corynebacteria*, *Staphylococci* and *Bacillus* species. Blood is collected from peripheral vein (e.g. cubital vein)[11]. The rate of contamination is higher from IV catheter blood samples since colonizers present in catheter gives false positive results. 70% isopropyl alcohol is used to disinfect the site of venepuncture. The person collecting the blood should use gloves. Blood should be collected during febrile episodes as early as fever and chills. It is also essential to collect blood samples before starting antibiotic therapy or end of a dosing interval. As adults with BSI, the colony forming units per millilitre of the blood are very low, an adequate sample volume of blood is needed for the effective finding of bacteraemia. Results through study determine that the yield rises by 3.2% for every millilitre of blood cultured. For adults 10-20mL of blood per culture is required to increase the yield by 30 percent. The rate of detection increases with the blood cultures number. The first blood culture should be obtained at the same time and inoculated into two different media and at two different temperatures. The second set of culture should be obtained in the same way & the sensitivity rate increases to 99%. There are no current recommendations for ideal time difference between two blood culture[13].

The media that is commonly used for Blood culture (BC) is nutritionally enriched with Tryptic or Trypticase soy, brain heart infusion, Columbia Agar and Brucella broths. These commercially available media contain; anticoagulant Sodium polyanethol sulfonate (SPS, Liquoid) 0.025% to 0.05% concentration. Immediate transportation of blood cultures and processing in the laboratory is required for appropriate recovery of pathogens. Blood cultures processing comprises gram staining, incubation and processing by manual and/or automated blood culture systems. The two commercially available manual Blood culture systems are variations of classic biphasic media bottles known as Castaneda bottles. They are the Oxoid signal system, BBL Septi-Check Blood culture system, lysis centrifugation blood culture system (Wampole Isostat / Isolator Microbial system). Currently, automated blood culture systems have been widely used. They are BACTEC 460 (Becton Dickinson), BACT/ALERT microbial detection system, the BACTEC 9240/9120 blood culture system, the TREK ESP culture system, etc. For these special blood culture bottles are used, different for aerobic and anaerobic organisms. Then after getting flagged positive blood culture bottles, direct gram stain is done[14]. Also they are cultured on to suitable media like blood agar or chocolate agar and MacConkey agar, Sabouraud's dextrose agar, etc. for the identification of the organism. Either manual testing by doing various conventional biochemical tests is done or either another automated system like VITEK 2 can be used. After identification antibiotic /

antifungal sensitivity testing is done manually like via disk-diffusion or broth dilution methods or by VITEK 2 (if applicable). A number of the molecular approaches have come that can improve the conventional culture-based identification like Polymerase Chain Reaction (PCR)[15].

The importance of management of BSI is huge. According to Bayer's principles followed are; treatment relay on ABST pattern, the choice of antibiotics is administered by the susceptibility of causative organism, minimal inhibitory concentration determination for optimal treatment, proper dose of the antimicrobial therapy to reach the sustained antibacterial activity, bactericidal agents are favoured over the (bacteriostatic) agents, combination therapy produces a quick bactericidal effect, etc. Past few years, growing incidence of BSIs by bacteria with the resistance against the commonly used antimicrobial agents have been observed by the clinicians. Preferred empiric monotherapy for sepsis of unknown origin includes drugs like; imipenem, meropenem, tigecycline or piperacillin-tazobactam. The empirical combination therapy includes; aztreonam, metronidazole plus levofloxacin or a third- or fourth-generation cephalosporin. For sepsis associated with *Candida* antifungals like Fluconazole, Amphotericin-B, Caspofungin, etc. can be used. Mainstream antimicrobial therapy should be started within 1-2 hours of getting the blood culture of patient to improve the prognosis. Also, de-escalation of antimicrobials is equally important to prevent complications like antimicrobial resistance, adverse effects of drugs; also, to reduce the financial burden. Proper disease management, alternative diagnostic procedures like detection of inflammatory markers, could be helpful for clinicians to optimize the limited use of antibiotics among general patients to prevent the development and emergence of resistance. The early antibiotic strategy must be paired with a full commitment to the antibiotic stewardship[16][17].

3. SUMMARY

Sepsis, a medical emergency leading to high mortality rate and adverse outcomes. So that is why, the appropriate and timely treatment is important part of therapy to prevent life-threatening complications. Despite growing developments in molecular diagnostic techniques, analysis of blood culture are the gold standard for diagnosing sepsis. The key to success is early and accurate identification, which plays a major role in the management of the patient. Resistance is a major concern. Early administration of the broad-spectrum antimicrobial drugs is most important factor for treatment of the patients with sepsis or septic shock. Antimicrobial agent therapy is advised to de-escalate as soon as possible depending on the improvement in patient's condition. So continuous re-assessment of the disease progression as well as administration of the adequate antibiotic therapy are important part of the patient care.

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