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A PROSPECTIVE STUDY ON MICROBIAL ISOLATES FROM BLOOD CULTURE AND ITS SOURCE IN PATIENTS WITH SEPSIS IN A TERTIARY CARE HOSPITAL

L.suja*	Assistant Professor, Department of General Medicine, Sri Ramachandra Medical College & Research Institute, Porur, Chennai. *Corresponding Author
S. Krishnamoorthy	Assistant Professor, Department of General Medicine, Sri Ramachandra Medical College & Research Institute, Porur, Chennai.
Swati Raju	Post graduate, Department of General Medicine, Sri Ramachandra Medical College & Research Institute, Porur, Chennai.
Bhaskar Reddy	Professor, Department of General Medicine, Sri Ramachandra Medical College & Research Institute, Porur, Chennai. Chennai.

ABSTRACT

Objectives: To determine the commonest blood culture isolate in patients with sepsis admitted in ICU in a tertiary care hospital.

Methods: This prospective observational study was done in ICU patients admitted with sepsis . They were categorized into sepsis, severe sepsis and septic shock. Outcome of sepsis was studied in terms of recovery and mortality.

Results: Of 115 patients, majority had septic shock (46.08%) followed by severe sepsis in 34.78% and sepsis in 19.13% . MSSA was the commonest organism (25.21%) isolated in blood culture followed by E.Coli (18.26%). Major source of infection was in abdomen (20%) and respiratory tract (18.28%). Mortality was 13.63% in sepsis, 62.5% in severe sepsis and 90 % in septic shock.

Conclusion: Out of 115 sepsis patients in ICU , majority (46.08%) had septic shock. The commonest organism identified was MSSA and abdomen was the commonest source of sepsis. Highest mortality was seen in patients with septic shock (90%).

KEYWORDS : blood culture, sepsis, MSSA, Intensive care unit

Introduction:

India is facing various health issues with a population of 1.31billion. Among them is management of illnesses like 'Sepsis', which is affecting not only rural India but is also in urban India. The incidence of sepsis in India is 7.5 lakh cases every year with a mortality rate of 12.08% in sepsis and 59.26% in severe sepsis.

Sepsis is the second leading cause of death world wide[1]. Despite the advances in the modality of treatment and newer drugs during the recent times, rate of sepsis is increasing in patients due to immunosuppression, advanced age and multidrug resistant infection[2,3]. It is a major cause of death in intensive-care units worldwide, with mortality rates that range from 20% for sepsis, through 40% for severe sepsis, to over 60% for septic shock.

The incidence of sepsis is influenced by various racial and ethinic groups, winter season and advancing age[4,5].The microbiological spectrum of sepsis has changed over the time. We are not able to identify the organism in blood culture in half of the patients with sepsis [6]. This is probably due to slowly growing organisms, prior antibiotic administration or absence of microbial invasion into the blood stream.Though fungal sepsis is increasing ,its incidence remains lower than that of the bacterial sepsis

The aim of the present study is to determine the commonest blood culture isolate in patients with sepsis admitted in 3 intensive care units [ICU] from December 2010to August 2012 in our institution, a tertiary care medical college and hospital. Patients admitted in ICU were screened for sepsis using SIRS criteria. After a thorough history and examination of the patient routine investigations and culture from blood were obtained.

MATERIALS AND METHODS

STUDY DESIGN:

1.This prospective, observational study was done in a tertiary care medical college and hospital in south India after ethical approval over a period of 21 months from December 2010 to August 2012. All the patients who were admitted in ICU were screened for sepsis. All patients were thoroughly evaluated with a detailed history and appropriate investigations in relation to the clinical diagnosis. We enrolled 115 patients in three intensive care units who satisfied the SIRS criteria for sepsis and/or positive blood culture . Patients with prior hospitalisation in the last 48 hours for sepsis and usage of antibiotics prior to hospitalisation were excluded.

Sepsis in the study subjects was identified with SIRS criteria for sepsis as put forth by the American College of Chest Physicians/ Society of Critical Care Medicine Consensus Conference 1992.[7].

SIRS is clinically recognised by the presence of 2 or more of the following:

a. Temperature >38 degree or < 36 degree centigrade
b. Heart rate > 90/minute
c. Respiratory rate > 20/ min or PaCo2< 32
d. WBC > 12000 or < 4000

Later,they were then sub divided into those presenting with sepsis, severe sepsis and septic shock based on ABG, CBC, blood pressure and urine output.

Sepsis: based on SIRS criteria or a positive blood culture.

Severe sepsis: SIRS with some degree of organ hypofunction –BP <90mm Hg or MAP <70mm Hg,Urine output <0.5 ml/Kg/Hour for 1 hour despite adequate fluid replacement,PaO_2 /FiO_2<250,Platelet <80000/cumm or unexplained acidosis.

Septic shock: Sepsis with hypotension or need for ionotropes to maintain BP.[8]

In order to identify the source of sepsis Chest X-Ray, Ultrasound Abdomen, and CT of specified regions were done. . The patients who succumbed and survived were also analysed.

RESULTS:

A total of 115 patients were included in our study during the study period with a age group between 22-96 years with a mean age of 54.007 years. The gender distribution showed a male preponderance of 74 (65%) and female of 41(35%). Of the patients admitted, 22 (19.13%) had sepsis, 40 (34.78%)had severe sepsis and 53(46.08%) had septic shock as shown in figure1. Among the positive blood cultures analysed 29 patients (25.21%) were positive for Methiciilin Sensitive Staphylococcus Aureus, Followed Organisms Like Enterobacter Spicies, Serratia, Haemophilus Influenza, Burkholderia, Staphylococcus Haemolyticus and non fermentor gram negative bacilli which were found in small proportion. The distribution of organisms isolated isolated is depicted in figure 2.

After the organism was isolated appropriate investigations were done to find out the source of sepsis. The commonest source of sepsis was from abdomen in 23 patients (20 %). Next common source of infection

was found to be from respiratory tract in 21 patients (18.28%), followed by urinary tract in 19 patients (16.5%). Other sources of infection were skin and soft tissue in 10 (8.6%), CNS in 9 (7.8%), malignancy in 3 (2.6%). There were other sources like gynaecological in 4 patients (3.4 %), complicated malaria in 2 patients(1.73%), salmonella species in 7(6%) . We could not find the source of infection 17 patients (14.7%). The source of distribution is depicted in figure 3.

We also studied the comorbid conditions in our patients. Diabetes mellitus was associated in 54 patients (46.95 %). 7 (6.08%)were alcoholics , and 7(6.08%) patients had immunocompromised. Sepsis was noted in 3 cases (2.6%) who had malignancy. No comorbids were noted in 44 patients (38.29%).

Of 115 patients 75 patients (65%) were deceased and 40 patients (35%) with sepsis survived. The mortality in sepsis was found to be in 3 patients (13.63%) and 25 patients (62.5%)in severe sepsis . The highest mortality of 47 patients (90%) was noted in patients who had septic shock . (figure 4)

Sepsis was subdivided into sepsis, severe sepsis and septic shock as shown in figure 1.

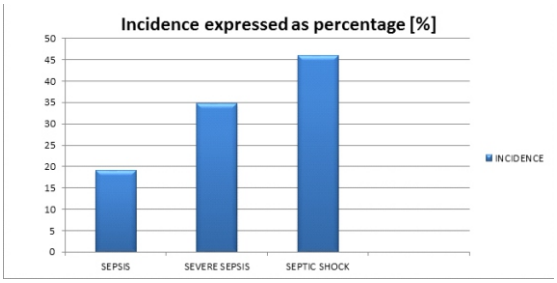


Figure 1 : Types of sepsis

The microbial isolates in blood culture samples in sepsis is shown as follows.

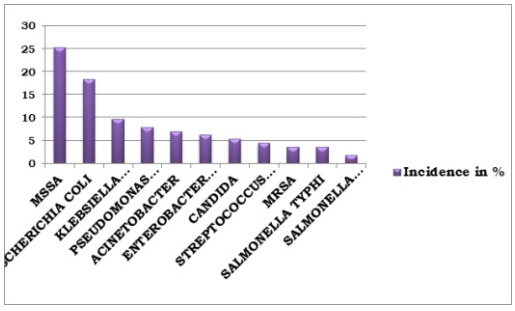
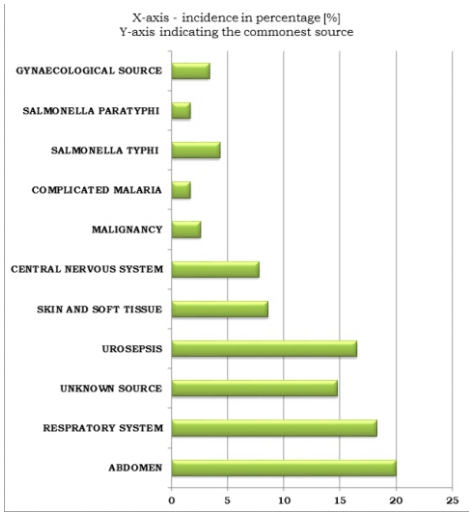
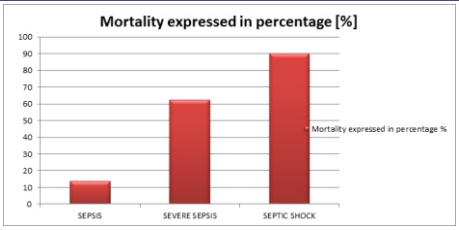


Figure 2

Source Of Distribution In Sepsis [figure 3}



Mortality In Each Category Of Sepsis [figure 4]



[X-AXIS REPRESENTS THE CATEGORY OF SEPSIS AS PER SIRS CRITERIA]
[Y-AXIS REPRESENTS THE INCIDENCE EXPRESSED IN PERCENTAGE %]

DISCUSSION:

A total of 115 patients with Sepsis were studied. Male sex preponderance (65%) was noted compared to female sex (35%). Age groups were near normally distributed with the sample mean age being 54.007 years. The youngest patient being 22 years and the oldest being 96 years.

INCIDENCE OF SEPSIS [Figure 1]:

The prevalence of patients admitted with sepsis noted in this study was 19.13%, while that of severe sepsis was 34.78% and septic shock was 46.08%.

As previously reported, this observation is supported by various studies:

1. Study by Todi et al the incidence of severe sepsis was 13.1% with mean age of study population as 54.9 years of which 67% were male [9]
2. A Brazilian teaching Hospital reported sepsis in 2.5%, severe sepsis in 22.8% and septic shock in 21.6% with 60% male sex preponderance [10].
3. The EPISEPSIS group survey in French ICUs documented an overall attack rate of 14.6% for severe sepsis with mean age of males being 65 years [11].
4. Similar reports were seen in various other studies conducted by Padkin et al and Angus et al.

COMMONEST MICROBE ISOLATED FROM BLOOD CULTURE SAMPLES IN SEPSIS. [Figure 2]:

Among the 115 blood cultures of patients analyzed in this study, 25.21% was Methicillin Sensitive Staphylococcus aureus [MSSA], followed by Escherichia coli with 18.26% of total incidence. Methicillin Resistant Staphylococcus aureus [MRSA] was only 3.47%. Isolation of Salmonella Typhi was relatively low by blood culture at 3.47%. Fungal isolates were mainly Candida- 5.21%. A predominance of Gram negative organisms were noted.

These findings are in support with multiple studies across the globe:

1. The National Nosocomial Infections Surveillance (NNIS) reported that Staphylococcus aureus were the most common organism isolated in ICU patients. This surveillance was done over 11 years [12,13]
2. A study in Pakistan resulted as 30 out of 41 blood cultures growing Staphylococcus aureus followed by Enterococcus and Klebsiella [14].
3. A study in Kuala Lumpur also had similar findings- S. aureus- 10.4%, with E.coli closely following at 9.7% [15].
4. S.aureus was the most common isolate in a hospital in Lahore with 54.43% incidence.

In our study out of the total number of patients, in a small proportion of blood culture, 2 were Enterobacter species, 1 each of Serratia, Haemophilus Influenzae and Burkholderia, 2 Staphylococcus Haemolyticus, and 1 non fermenter gram negative bacilli.

SOURCE OF DISTRIBUTION [Figure 3]

This study illustrated more of an abdominal source of distribution of sepsis. Total abdominal sepsis cases were 23 (20% prevalence) out of which Spontaneous bacterial peritonitis (SBP) prevailed in 15 cases, followed by hepatitis and pancreatitis in equal distribution.

Respiratory system was involved in 21 cases (18.28%) in the form of bronchopneumonia representing (11/21) and lobar pneumonia (3/21). The incidence of urosepsis was 16.5%, skin and soft tissue mainly cellulitis in patients with diabetes mellitus was 8.6%.

The source could not be identified in 17 out of 115 patients . 2.6% of

patients had associated malignancy in form of carcinoma colon, retroperitoneal sarcoma and Hodgkin's lymphoma.

1. Jonathan M Siner conducted a study which illustrated respiratory and genitourinary systems combined are the source in 65.3% of patients with sepsis [16].
2. A European multicentre study showed respiratory system accounted for 60% and abdominalsource 20% [17].
3. In a study conducted by Todi et al lung was the most common source of infection [9].
4. Similarly, the study in a Brazilian Hospital revealed Pneumonia was the most frequent infection site (66.5%)[10]
5. Scottish survey showed in those with severe sepsis or septic shock, the major source of sepsis as bronchopulmonary (56.5%)[18].

Diabetes Mellitus type 2 was associated in 46.95% of cases, immunocompromised states and chronic alcohol use had 6.08% incidence.[19,20]. Malignancy was seen in 2.6% of cases with sepsis. Various studies around the world also reported high prevalence of sepsis rates among diabetics.

In 38.29 % of cases with sepsis had no associated co-morbid conditions in our study.

The mortality in sepsis was found to be 13.63%, severe sepsis was 62.5% and septic shock had the highest mortality of 90%. [Figure 4]
The mortality in this study was 65%, whereas 35% of patients with sepsis survived.

LIMITATIONS:

- The present study was performed on a small study group hence, it may not have been representative of the general population
- Antimicrobial susceptibility was not studied.
- The study does not analyse the correlation between the various co-morbid
- Illnesses and sepsis outcome.

CONCLUSION:

To finally conclude, in a total of 115 patients with sepsis diagnosed by SIRS criteria, 19.13% had sepsis, 34.78% had severe sepsis and septic shock was seen in 46.08%.

Male sex preponderance (65%) was noted compared to female sex (35%). Age groups were near normally distributed with the sample mean age being 54.007 years.

In this study, Methicillin Sensitive Staphylococcus aureus [MSSA] was the most common organism isolated followed by Escherichia coli . Methicillin Resistant Staphylococcus aureus [MRSA] , Fungal isolates and few gram negative organisms were isolated in small proportion . Overall a predominance of Gram negative organisms were isolated.

The commonest source of sepsis was abdomen , closely followed by respiratory system and urinary tract. The mortality in this study was 65%, whereas 35% of patients with sepsis survived. The mortality in sepsis was found to be 13.63%, severe sepsis was 62.5% and septic shock had the highest mortality of 90%. [Figure 4]

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