

Original Research Article

Staphylococcus aureus still the commonest culprit

Saurabh Kumar¹, Yousuf Faisal², Rajib Ratna Chaudhary², Mukund Shyam Sarda^{2*}

¹Department of Microbiology, Varun Arjun Medical College and Hospital, Shahjhanpur, Uttar Pradesh, India

²Department of General Medicine, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India

Received: 22 July 2020

Revised: 27 August 2020

Accepted: 02 September 2020

*Correspondence:

Dr. Mukund Shyam Sarda,

E-mail: mukundsarda18@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Sepsis is still one of the most leading cause of death in world. 19 million sepsis (formerly severe sepsis) cases and 5 million sepsis-related deaths are estimated to occur annually. Sepsis is also one of the most common cause of patients getting critically ill and getting admission in intensive care unit. The main focus of this study is to identify the culture isolate from the critically ill patients and to check for the antibiotic sensitivity and resistance and identify if the report has changed the course of treatment and outcome of the patients. Critical illness is a life-threatening multisystem process that can result in significant morbidity or mortality. Critically ill patients are those who have dysfunction or failure of one or more organs/system and depend on survival from advanced instruments of monitoring and therapy. The aim of the study was to identify the causative organism causing sepsis in critically ill patients.

Methods: It will be multi central retrospective study which included patients of critical illness of Rohilkhand Medical college, Bareilly, Uttar Pradesh and Varun Arjun Medical college, Shahjhanpur, A total of 468 patients were taken for the analysis during period of from August 2018 to November 2019 among of which 324 samples came positive. Samples were taken on day one of the patient's presentation to the hospital and were analysed in BD BACTEC culture medium. Patient's data were taken from records available at both the hospitals. Sensitivity was performed using disk diffusion method and the results were compared with the records of patients.

Results: Among of samples taken that is 324; 194 were male and 130 were female. Maximum patients which were tested positive for *Staphylococcus aureus* (n=198). Others included *Streptococcus pneumoniae* (n=25), *Escherichia coli* (n=50), *Klebsiella oxytoca* (n=13), *Klebsiella pneumoniae* (n=15), *Pseudomonas aeruginosa* (n=20), and *Acinetobacter* (n=3). In retrospective analysis of the patients of all 324 cases treatment in approximately 148 patients was changed due to change in the sensitivity of antibiotics.

Conclusions: *Staphylococcus* still dominates the sepsis. It is advisable to add an antibiotic with gram negative if patients count does not improve in first 24 hour.

Keywords: *Staphylococcus aureus*, Critically ill, Blood culture

INTRODUCTION

Sepsis is still one of the most leading cause of death in the world. 19 million sepsis (formerly severe sepsis) cases and 5 million sepsis-related deaths are estimated to occur annually.¹ Sepsis is also one of the most common cause of patients getting critically ill and getting admission in intensive care unit.

The probable cause of sepsis varies from one area to other and hence there are many problems regarding the decision of further management of patients. Various methods have been now used to initiate the treatment but the better approach can only be taken if the culprit organism is known. Blood culture essentially, is one of the best technique to identify the cause of the organism. Though

time consuming and also expensive, if done timely can surely save many lives.

The main focus of this study was to identify the culture isolate from the critically ill patients and to check for the antibiotic sensitivity and resistance and identify if the report has changed the course of treatment and outcome of the patients. Critical illness is a life-threatening multisystem process that can result in significant morbidity or mortality. Critically ill patients are those who have dysfunction or failure of one or more organs/system and depend on survival from advanced instruments of monitoring and therapy.²

The aim of the study was to identify the causative organism causing sepsis in critically ill patients and the objectives were to study the sensitivity and resistance pattern of microbes, and also to evaluate whether this pattern has any change in the outcome of the patient's management.

METHODS

It was multi central retrospective study which included patients of critical illness of Rohilkhand Medical College, Barilley Uttar Pradesh and Varun Arjun Medical College, Shahjanpur, Uttar Pradesh. A total of 468 patients were taken for the analysis during period of From August 2018 to November 2019 among of which 324 samples came positive. Samples were taken on day one of the patient's presentation to the hospital and were analyzed in BD BACTEC culture medium. Patient's data were taken from records available at both the hospitals. Sensitivity was performed using disk diffusion method and the results were compared with the records of patients.

When a 6-mm filter paper disk impregnated with a known concentration of an antimicrobial compound is placed on a Mueller-Hinton (MH) agar plate, immediately water is absorbed into the disk from the agar. The antimicrobial begins to diffuse into the surrounding agar. The rate of diffusion through the agar is not as rapid as the rate of extraction of the antimicrobial out of the disk, therefore the concentration of antimicrobial is highest closest to the disk and a logarithmic reduction in concentration occurs as the distance from the disk increases.³ The rate of diffusion of the antimicrobial through the agar is dependent on the diffusion and solubility properties of the drug in MH agar.⁴

For each drug, indicate on the recording sheet whether the zone size is susceptible (S), intermediate (I), or resistant (R). Zones were calculated on the basis of diameter of the clearance of zones. Results were calculated using SPSS software. Ethical approval was taken from both hospitals for the study

Inclusion criteria

All patients who were declared critically ill and who gave consent for research purpose were included.

Exclusion criteria

Patients giving negative consent and those whose blood culture were negative were excluded from the study.

RESULTS

Among all the samples taken that is 324; 194 were male and 130 were female as shown in Table 1. Minimum age of patients which were selected was of 1 day and maximum age was 86. Mean age of patients was 52 years. Total number of paediatric (1 day to 14 years) patients were 129 which included 89 male and 40 female. Patients were mainly belonging to middle class as per Kuppaswami classification (n=94) as shown in Table 2 and Figure 2.⁵ Maximum patients which were tested positive for *Staphylococcus aureus* (n=198). Others included *Streptococcus pneumoniae* (n=25), *Escherichia coli* (n=50), *Klebsiella oxytoca* (n=13), *Klebsiella pneumoniae* (n=15), *Pseudomonas aeruginosa* (n=20), *Acinetobacter* (n=3) as shown in Table 3 and Figure 3.

Table 1: Sex wise distribution of patients.

Sex	Male	Female
Number of patients	194	130

Table 2: Socioeconomic scale wise distribution.

Class	Number of patients
Upper class	38
Upper middle	62
Middle class	94
Lower middle	56
Lower class	74

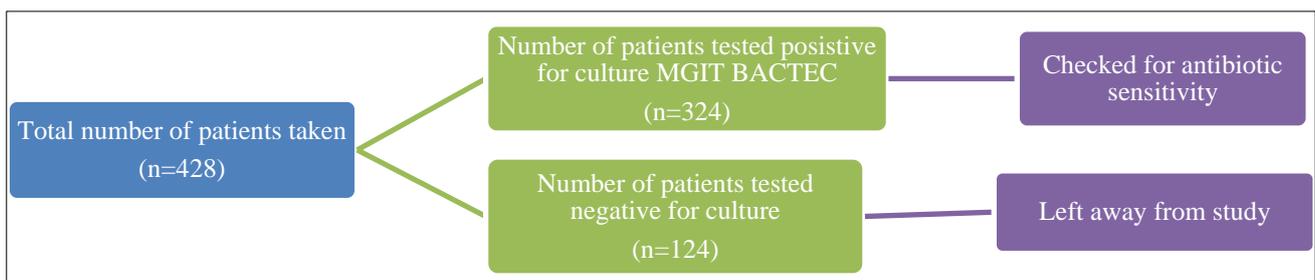


Figure 1: Distribution of patients.

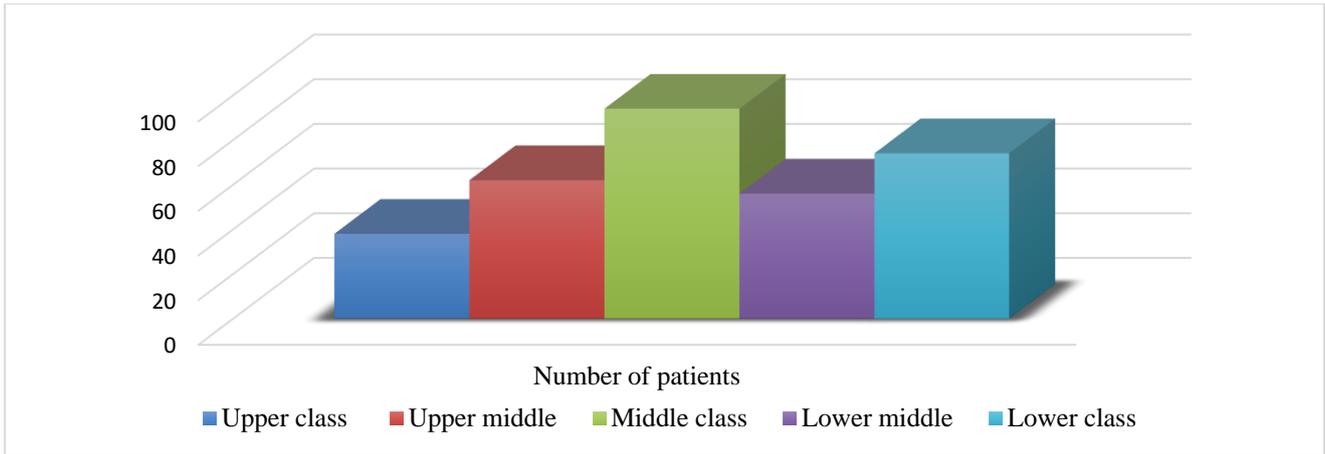


Figure 2: Socioeconomic distribution.

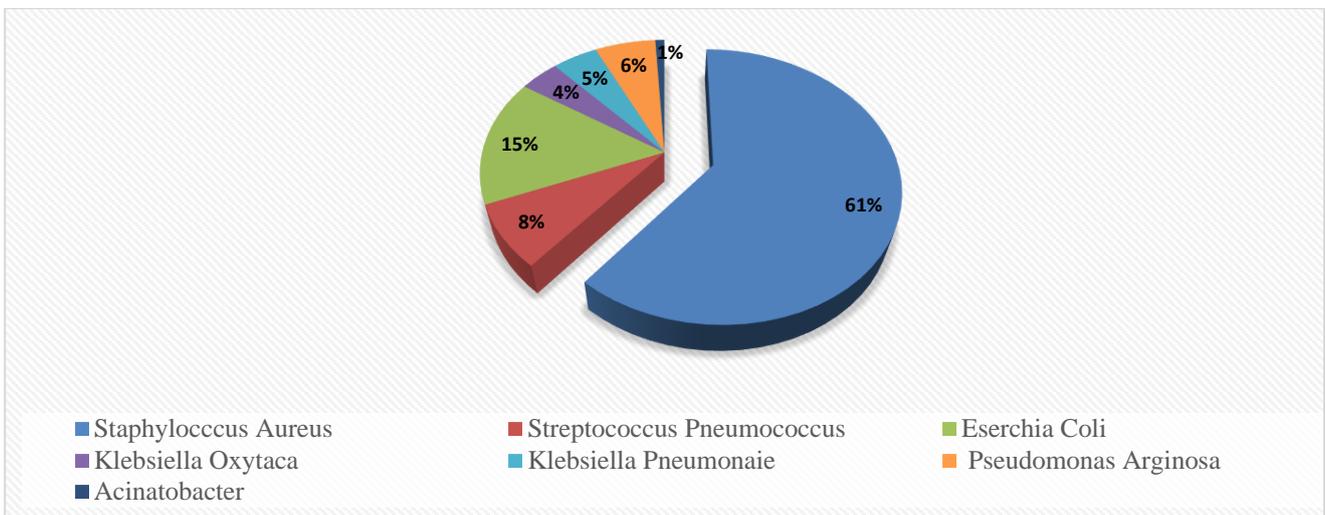


Figure 3: Percentage of patients getting affected by each microbe.

Table 3: Distribution of causative organism.

Type of bacteria	Number of patients
<i>Staphylococcus aureus</i>	198
<i>Streptococcus pneumococcus</i>	25
<i>Eserchia coli</i>	50
<i>Klebsiella oxytaca</i>	13
<i>Klebsiella pneumoniae</i>	15
<i>Pseudomonas aeruginosa</i>	20
<i>Acinetobacter</i>	3
Total	324

In sensitivity for *Staphylococcus aureus*, most of the patients were resistant with ampicillin (n=160), cotrimoxazole (156) and erythromycin (98). None of the patients were having resistance with vancomycin or linezolid. Similarly *Streptococcus pneumococcus* (n=20) like most of them were resistant to amoxicillin and none had resistance against vancomycin or linezolid. *Escherichia coli* had mixed type of picture with some

culture (n=3) having resistance against all except meropenem and imipenem and maximum species which were sensitive with amikacin (n=40) and none were sensitive to cotrimoxazole. *Klebsiella oxytoca* had good sensitivity against all fluoroquinolones and aminoglycosides. *Klebsiella pneumoniae* had developed resistance against most commonly used antibiotics which includes fluoroquinolones and aminoglycosides; it was found that 10 species were sensitive to tigecycline and 5 were moderately sensitive to it. It was also found that 2 species were resistant to colistin and none were resistant to polymyxin. *Pseudomonas aeruginosa* was sensitive with fluoroquinolones and also with 3rd generation cephalosporin. *Acinetobacter* was sensitive against tigecycline and colistin.

In retrospective analysis of the patients of all 324 cases treatment in approximately 148 patients was changed due to change in the sensitivity of antibiotics. It was also found that majority of changes was in cases where gram negative source of infection was there. Use of broad spectrum antibiotics has definitely reduced the mortality and has

improved outcome but better selection of antibiotics will improve much better outcome of patients.

DISCUSSION

Patients were mainly selected whenever sepsis was considered, since in developing countries like India where there is scarcity of sources it is very difficult to isolate bacteria and then culture it. All the precautions were taken as per sepsis 3 SSC (surviving sepsis campaign) bundle. Patients were mainly started on broad spectrum antibiotics which were taken as per protocol.⁵ In retrospective analysis it was found that mortality of patients having gram negative source of infection was more compared to with gram's positive the possible explanation would be not covering the bacteria in empirical treatment.

Another important finding was presence of *Staphylococcus* in such abundance in patients which might be also contributed because of poor hygiene and also because of it being highly contagious.⁶

Change in antibiotics had dramatically changed outcome of patients. Among of 148 patients 96 patients survived because of change in antibiotics. In remaining cases there can be argument regarding in vivo and in vitro efficacy of antibiotics; or it might have been too late to change.

CONCLUSION

Staphylococcus still dominates the sepsis. It is advisable to add an antibiotic with gram negative if patients count does not improve in first 24 hour. There is very much increase in resistance nowadays with some species (n=2) *Klebsiella pneumoniae* being sensitive to only polymyxin. Judicious approach of antibiotics in all cases of sepsis. All patients with probability of sepsis should undergo blood culture as early as possible for selection of antibiotics.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Fleischmann C, Scherag A, Adhikari NKJ, Hartog CS, Tsaganos T, Schlattmann P, et al. Assessment of global incidence and mortality of hospital-treated sepsis—current estimates and limitations. *Am J Respir Crit Care Med.* 2016;193:253-72.
2. Waydhays C. Equipment review. Intrahospital transport of critically ill patients. *Crit Care Med.* 1999;5:83-9.
3. Jorgensen JH, Turnidge JD. Susceptibility test methods: dilution and disk diffusion methods. In Murray PR, Baron EJ, Jorgensen JH, Landry ML, Pfaller MA ed. *Manual of Clinical Microbiology*, 9th ed. 2007;ASM Press, Washington, D.C.
4. Bauer AW, Kirby WMM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. *Am J Clin Pathol.* 1966;36:493-6.
5. Kuppuswamy B. *Manual of Socioeconomic Status (Urban)* 1st ed. Delhi: Manasayan; 1981;66-72.
6. Turabelidze G, Lin M, Wolkoff B, Dodson D, Gladbach S, Zhu BP. Personal hygiene and methicillin-resistant *Staphylococcus aureus* infection. *Emerg Infect Dis.* 2006;12(3):422-7.

Cite this article as: Kumar S, Faisal Y, Chaudhary RR, Sarda MS. *Staphylococcus aureus* still the commonest culprit. *Int J Res Med Sci* 2020;8:3571-4.