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Bacteriological Profile and Antibiogram of Blood Stream Infections in a Tertiary Care Hospital

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ABSTRACT:

Bloodstream infections (BSIs) are a cause of significant morbidity and mortality requiring urgent antibiotic treatment. However, there is widespread antibiotic-resistance from the bacterial causes, necessitating regular surveillance for drug-resistant bacteria and their antibiograms.The present study was conducted to isolate and identify the various bacterial pathogens of blood stream infections and to determine their antibiotic susceptibility patterns. The study was conducted in the Department of Microbiology and the blood samples sent for culture and sensitivity over a period of six months from January 2023 to June 2023 were included in the study. Samples were collected,transported and processed in the laboratory as per standard protocols.Antibiotic sensitivity test was done by Kiry Bauer disc diffusion method.

Out of 114 samples, 32 (28.07%) showed growth and 82 (71.93%) showed no growth. Gram positive organisms were more commonly isolated than Gram Negative organisms. The most predominant organism isolated was Staphylococcus aureus16 (50%), followed by Coagulase Negative Staphylococci 06 (18.75%).Among the Gram Negative organisms Escherichia coli 5 (15.63%) was most commonly found followed by Klebsiella pneumoniae3(9.37%) and Pseudomonas aeroginosa 2(6.25%).The Gram Positive organisms were sensitive to Linezolid andVancomycin. The Gram Negative organisms were more commonly sensitive to Imipenem, Meropenem and Cefotaxime.Early diagnosis and appropriate antimicrobial treatment is the basis for the successful treatment of sepsis. The understanding of local bacteriological profile and antimicrobial susceptibility patterns may help the clinician in rationalizing the empirical treatment strategies

KEYWORDS: Blood stream infections, Staphylococcus aureus, CONS, Escherichia coli, Klebsiellapneumonia

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INTRODUCTION:

Bloodstream infections (BSIs), which range from self-limiting bacteraemia to an outright life-threatening septicaemia, are some of the most common healthcare-associated infections globally. Bloodstream infections account for up to 9% – 11% of hospital-acquired infections in the developed countries of Europe and the United States, while higher prevalence of up to 19% has been recorded from low- and middle-income countries of the world.

The risk factors0 for BSIs include the use of healthcare devices such as: peripheral and central venous catheters on patients; age (elderly patient, neonates); and premorbid medical conditions of patients, such as diabetes mellitus, malignancies, renal failure, burns, and prior hospitalization[1].In current era, one of the major causes of morbidity and mortality, ranging from self-limiting to life threatening sepsis are Bloodstream infection (BSI) that requires rapid antimicrobial treatment. But the great concern is emergence of resistance among the bacterial pathogens causing these infections. Antimicrobial resistance among bacteria's are emerging grave public health concern in both developed and developing countries.

Blood culture remains the gold standard in the laboratory diagnosis and identification of bloodstream pathogens.Blood culture positivity rates among patients with BSI in developing countries range from 9.2% to 44.0%[2].In hospital setting, empirical start of antimicrobial therapy is a norm before the results of blood culture are available. But due to high mortality and morbidity associated with septicaemia, precise choice of empiric therapy is of importance Early identification of the causative pathogen and start of appropriate treatment can significantly reduce the morbidity, hospital stay and mortality among patients.

The objectives of this study are: to isolate and identify different bacterial causes of BSIs; to determine the antibiotic susceptibility patterns of isolated bacteria; and to suggest the best empirical treatment of BSIs in the hospital.

MATERIALS AND METHODS:

The study was conducted in the Department of Microbiology in a tertiary care hospital.

Study Period: January 2023 to June 2023

Study Population: A total of 114 blood samples were collected from patients suspected with blood stream infections who presented to the Outpatient and Inpatient Departments of Karuna Medical College, Palakkad, India.

Sample Processing:

Blood samples were collected before the administration ofantibiotics. Relevant details of the patientswere recorded. Blood was taken in BHI Broth1:5 ratio with all aseptic precaution. Theblood culture bottles were kept in incubatorfor 12-18 hrs then sub cultures were done on Blood agar, MacConkey agar[3]**.** The growthobtained was identified by colony morphology, Gram stain of the isolatedcolonies, standard microbiological, and biochemical test.

The antibiotic susceptibility pattern of the isolated organisms was performed by Kirby-Bauer disc diffusion method on Mueller-Hinton agar plates and results wereinterpreted as per the Clinical and Laboratory Standards Institute (CLSI) guidelines.Cefoxitin disc diffusion method was used to identify MRSA (Methicillin Resistant*Staphylococcus aureus*) as per CLSIguidelines.

The antibiotic discs that were used to identifythe susceptibility pattern includeAmikacin (30 mcg), Gentamicin (10 μg), Amoxicillin+clavulanicacid (20/10 mcg), Ceftazidime (30 mcg),Ceftriaxone (30 mcg), mcg),, Cotrimoxazole (1.25/23.75),Ciprofloxacin,Linezolid,Erythromycin, Vancomycin,, Imipenem, Meropenem, Piperacillin-Tazobactum.

RESULTS:

Out of 114 samples collected from Blood stream infection cases, 32(28.07%) showed growth and the remaining 82(71.93%) showed no growth**.(Table 1).**In this study Gram positive organisms were more commonly affected than Gram negative organisms.

The most commonly isolated organism was Staphylococcus aureus 16(50%) followed by Coagulase Negative Saphylococci 6(18.75%), Escherichia coli 5(15.63%), Klebsiellapneumoniae 3(9.37%) and Pseudomonas aeroginosa 2(6.25%). **(Table 2).**

Table 1.Distribution of culture positive cases.

S.No	Growth	No.of samples	% of samples
1.	Culture positive	32	28.07%
2.	Culture negative	82	71.93%
3.	Total	114	100%

Table 2:Frequency of different pathogens isolated from BSI cases

Organism	Frequency	Percentage
Staphylococcus aureus	16	50%
CoNS	**06**	**18.75%**
Escherichia coli	**05**	**15.63%**
Klebsiellapneumoniae	03	9.37%
Pseudomonas aeroginosa	02	6.25%

BSI: Blood Stream Infection

Among the Gram positive cases, Staphylococcus aureus was highly sensitive to Linezolid (100%) and Vancomycin (100%) followed by Erythromycin (96%). Coagulase Negative Staphylococci was most sensitive to Linezolid (100%), Vancomycin (100%) and Ciprofloxacin (100**%).(Table 3).**

Among the Gram Negative organisms Escherichia coli was most sensitive to Imipenem (100%) Meropenem (100%) followed by Cefotaxime (86%),Piperacillin-Tazobactum (8650Gentamycin (80%) and Ciprofloxacin (80%).Klebsiellapneumoniae was highly sensitive to Meropenem (100%),Imipenem (100%) and Ceftazidime (100%). Pseudomonas aeroginosa was most sensitive to Meropenem (100%),Imipenem (100%) and Cefotaxime (100**%).(Table 4).**

Table 3: Antibiotic sensitivity pattern of Gram positive organisms

Organisms	Ak	G	Cip	Ctr	Amc	Cot	Lz	Va	E
Staphylococcus aureus (n=16)	50%	80%	80%	70%	70%	40%	100%	100%	96%
CoNS(n=06)	33%	66%	100%	66%	67%	33%	100%	100%	96%

Ak-Amikacin, G-Gentamycin,Cip-Ciprofloxacin,Ctr- Ceftriaxone,Amc-Amoxy-clavulanicacid,Lz- Linezlid, Cot-CotrimoxazoleVa- Vancomycin,E-Erythromycin

Table 4: Antibiotic sensitivity pattern of Gram negative organisms

Organism	Ak	G	Cip	Ctr	CAZ	Pit	IPM	MRP	CTX
Escherichia coli(n=05)	70%	80%	80%	70%	70%	86%	100%	100%	86%
Klebsiellapneumoniae(n=03)	80%	80%	66%	66%	100%	86%	100%	100%	96%
Pseudomonas aeroginosa(n=02)	72%	85%	72%	86%	52%	86%	100%	100%	100%

Ak-Amikacin, G-Gentamycin,Cip-Ciprofloxacin,Ctr- Ceftriaxone ,Caz- Ceftazidime, Pit- Piperacillin-Tazobactam,IPM-Imipenem,Mrp-Meropenem,CTX-Cefotaxime.

DISCUSSION:

BSI is one of the major reasons of morbidity and mortality worldwide. Antimicrobial therapy is the mainstay of management of BSI along with treatment of severe sepsis and septic shock. The incidence of BSIs along with resistance against commonly used antimicrobials are on increasing trend during last few years[2]. This study gives information on thedistribution ofbacterial isolates causing bloodstream infections with their antibioticsusceptibility pattern which plays animportant role in effective management ofpatients in septicemia.

In this study, the culture positivity rate was 28.07% which is similar to a study done by Ashokkumar Sharma et al where the positivity rate was 28**%**[2]**.** In the present study Gram positive organisms were more commonly isolated when compared to Gram negative organisms and Staphylococcus aureus 16(50%) was the frequently isolated one.This is similar to a study by Mukta et al [4]**.**

Among the Gram negative organisms Escherichia coli 5(15.63%) was frequently isolated followed by Klebsiellapneumoniae 3(9.37%). This is in concordance with the study by Charanjeevkauret**al**[5]**.** In this study Staphylococcus aureus was highly sensitive to Linezolid (100%) and Vancomycin (100%).The second commonly isolated organism was Coagulase Negative Staphylococci and was highly sensitive to Linezolid (100%) and Vancomycin (100%).This correlates with a study byAshimakatyalet al[6] and Wajid et al[7]**.**

In this study Escherichia coli was found to be highly sensitive to Imipenem (100%) and Meropenem (100%). This data coincides with a study done byAshimaet al[6]. Klebsiellapneumoniae was most sensitive to Imipenem (100%, Meropenem(100%) and Ceftazidime (100%) this coincides with a study by Anita jhaijhria**et al**[8]. Pseudomonas was highly susceptible to Imipenem (100%), Meropenem (100%) and Cefotaxime (100%) which is similar to a study by Oluwalanaet**al**[1].

CONCLUSION:

It is vital for physicians to renew themselves with up to date data regarding the causative agents of frequent bacterial infections in a particular geographical area in addition to its antimicrobial susceptibility and resistance pattern. The information of etiological prototype and their antibiogram pattern can be useful while framing the antibiotic guidelines for any medical institution. Strict infection control methods as well as well-judged antibiotic guideline for antibiotic therapy should be executed in the health care institution as control measures in opposition to BSIs.

From this study we conclude that isolation rate of Gram positive organisms, Staphylococcus aureus and Coagulase Negative Staphylococci were more commonly isolated followed by Escherichia coli, Klebsiellapneumoniae and Pseudomonas aeroginosa. The Gram positive organisms were highly sensitive to Linezolid and Vancomycin. The Gram negative organisms were highly sensitive to Imipenem and Meropenem. Surveillance of the local BSI etiology is necessary for the formulation of hospital antibiograms and effective empirical treatment of sepsis in that particular area.

REFERENCES:

1. Oyekale OT, Ojo BO, Olajide AT, Oyekale OI.et al. Bacteriological profile and antibiogram of blood culture isolates from bloodstream infections in a rural tertiary hospital in Nigeria. African Journal of Laboratory Medicine. 2022;11(1):a 1807. 1 -7.

2. Ashok kumarSharmaet al. Bacteriological Profile and Antibiogram of Bloodstream Infection. International Journal of Medical Research Professionals.2019 March: 5(2):187-92.

3. Laxmi Kant Khanal. Bacteriology and antibiogram of blood culture.International Journal of Health Sciences and Research. August 2020:10(8); 10-14.

4. MuktaSawargaonkar et al.Bacteriological Profile of Blood Stream Infections Along with their Antibiogram at Government Cancer Hospital, Aurangabad **.**International Journal of CurrentMicrobiology andApplied Sciences.20198(5): 2082-2091.

5. CharanjeevKaur, Sarbjeet Sharma. Bacteriological Profile and their Antibiotic Susceptibility Pattern in Bloodstream Infections in a Tertiary Care Hospital in North India. Journal of Pure and Applied Microbiology.2022:16(4): 2756-2763.

6. AshimaKatyal et al.Bacteriological Profile and Antibiogram of Aerobic Blood Culture Isolates from Intensive Care Units in a Teaching Tertiary Care Hospital Journal of Health Sciences & Research, January-June 2018;9(1):6-10.

7. M Wajid andShaziaNaaz.A study of bacteriological profile and antimicrobial susceptibility pattern of bacteria isolated from blood stream infections in a tertiary care hospital .Panacea Journal of Medical Sciences 2023;13(1):175–180.

8.   Anita Jhajhria et al. Bacteriological profile and antimicrobial susceptibility of blood culture in a tertiary care hospital Ajmer.International Journal ofMedical and Health Research.June 2018;4(6); 07-11.