



BACTERIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF BLOOD CULTURE ISOLATES FROM A TERTIARY CARE TEACHING HOSPITAL, SOUTH INDIA

Microbiology

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ABSTRACT

Blood stream infections range from mild infections to life threatening sepsis requiring appropriate and aggressive anti microbial therapy. A retrospective study was undertaken to identify the microbial profile with their antibiogram among the blood culture isolates in a teaching hospital from June 2017 to November 2017. 1101 blood culture samples processed at the microbiology lab were analyzed. The bacterial isolates from positive culture were identified by standard protocols and antimicrobial susceptibility patterns were identified by CLSI guidelines. Positive blood cultures were obtained in 13.7% (151/1101). Gram positive bacteria accounted for 58.27% (88) and Gram negative 41.72% (63) with predominance of *S.aureus* 39.73% (60) followed by *K.pneumoniae* 29.8% (45). 18.33% of *S.aureus* was MRSA and 100% sensitive to vancomycin. 22.44% of *K.pneumoniae* was ESBL producers. All Gram negative isolates were sensitive to imipenem and meropenem. The present study provides the necessary information on the microbial profile with their antibiogram of the blood stream infections that may help in the formulation of antibiotic policy for effective patient care.

KEYWORDS

Blood stream infections, antimicrobial susceptibility pattern, MRSA, ESBL

Introduction

Blood stream infections are an important cause of morbidity and mortality in the health care setting (Negussie et al 2015). It results in prolonged hospital stay, high cost to the patient and the hospital, and in many instances loss of life (Bailey and Scotts 2002). Approximately 2, 00,000 cases of bacteraemia and fungemia occur annually with mortality rates ranging from 20%- 50% (Renu et al 2014).

There is a steady increase in antimicrobial resistance worldwide which is subjected to regional variation (Jadhav et al 2012). Thus a regular surveillance of blood stream infections mandates to understand the microbiological profile and their susceptibility pattern in a particular area (Karunakaran et al 2007).

Therefore this study was undertaken to determine the profile and antimicrobial susceptibility pattern of the blood culture isolates in a tertiary care hospital and to provide a useful guide to the clinicians to initiate effective empirical therapy.

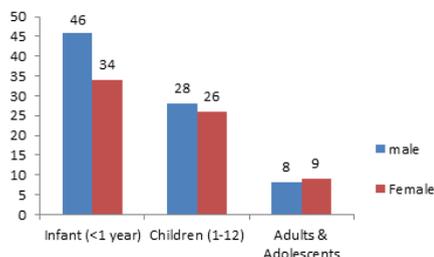
Materials and Methods

A retrospective study was conducted in a tertiary care hospital in South India for a period of 6 months from June 2017 to November 2017. A total of 1101 blood culture samples from clinically suspected cases of septicemia were processed by standard microbiological method and antimicrobial susceptibility testing by Kirby- Bauer disc diffusion method as per CLSI guidelines. A data on sociodemographic variables such age, gender, blood culture results and their antimicrobial susceptibility pattern were collected manually from laboratory register and analyzed statistically.

Results

Out of 1101 blood cultures, 151 (13.7%) gave positive result.

Fig 1: Age and gender wise distribution of positive blood cultures (n=151)



From 151 culture positive samples, 82 (54.3%) were males and 69 (45.7%) were females.

Table (1): Ward wise distribution of blood culture isolates (n=151)

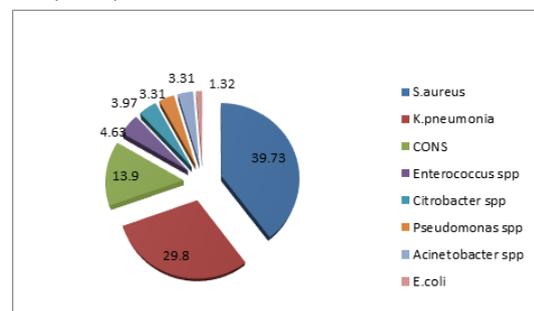
Organism	NICU	PICU	Pediatric	Medicine	Surgery	OG
<i>S.aureus</i>	34	10	7	6	-	3
CONS	9	9	2	-	-	1
<i>Enterococcus spp</i>	3	4	-	-	-	-
<i>K.pneumoniae</i>	25	11	6	1	1	1
<i>Citrobacter spp</i>	4	1	-	1	-	-
<i>E.coli</i>	-	1	-	-	1	-
<i>Pseudomonas spp</i>	3	1	-	1	-	-
<i>Acinetobacter spp</i>	2	2	-	1	-	-
Total	80	39	15	10	2	5

Out of 151 positive blood culture isolates, NICU showed maximum culture positivity 80 (53%) followed by PICU and Pediatric ward combined 54 (35.8%).

All blood culture isolates were monomicrobial.

Among 151 blood culture isolates, Gram positive and Gram negative bacteria constituted 88 (58.27%) and 63 (41.72%) respectively.

Fig (2): Distribution of bacteria among the positive blood culture isolates (n=151)



The predominant bacterial isolate from blood culture was *S.aureus* 60 (39.73%), followed by *K.pneumoniae* 45 (29.8%), *CONS* 21 (13.9%), *Enterococcus spp* 7 (4.63%), *Citrobacter spp* 6 (3.97%), *Pseudomonas spp* 5 (3.31%), *Acinetobacter spp* 5 (3.31%) and *E.coli* 2 (1.32%).

Table (2): Antimicrobial susceptibility pattern of the Gram positive isolates in blood culture (n=88)

Antibiotic	S.aureus (n=60)	CONS (n=21)	Enterococcus spp (n=7)
Ampicillin (10 µg)	32 (53.33%)	20 (95.23%)	(14.28%)
Gentamycin (10 µg)	50 (83.33%)	18 (85.71%)	NT
Gentamycin (120 µg)	NT	NT	(42.85%)
Cefoxitin (30 µg)	49 (81.67%)	20 (95.23%)	NT
Erythromycin (15 µg)	38 (63.33%)	14(66.67%)	2(28.57%)
Ciprofloxacin (5 µg)	42 (70%)	17(80.95%)	2(28.57%)
Vancomycin (30 µg)	60 (100%)	21 (100%)	7 (100%)

All Gram positive isolate showed 100% sensitivity to vancomycin. MRSA was found in 21 (18.33%) and MRCONS in 1 (4.77%). Among the Gram positive isolates, *S.aureus* showed a high degree of resistance to ampicillin (46.67 %) followed by erythromycin (36.67

%) and ciprofloxacin (30%). Enterococcus spp also showed high degree of resistance to ampicillin (85.28%) followed by erythromycin (71.43%) ciprofloxacin (71.43%) and high level gentamycin (57.15%).

Table (3): Antimicrobial susceptibility pattern of the Gram negative isolates in blood culture (n=63)

Antibiotic	K.pneumoniae (n=45)	Citrobacter spp (n=6)	Pseudomonas spp (n=5)	Acinetobacter spp (n=5)	E.coli (n=2)
Gentamycin (10 µg)	31(68.88%)	4(66.67%)	4(80%)	2(40%)	1(50%)
Cefotaxime (30 µg)	33(73.33%)	4(66.67%)	3(50%)	2(40%)	1(50%)
Ceftazidime (30 µg)	33(73.33%)	4(66.67%)	3	2(40%)	1(50%)
Cefotaxime/ Clavulanic acid (30 µg/ 10 µg)	40(88.88%)	5(83.33%)	5(100%)	3(60%)	2(100%)
Cefoperazone sulbactam (75 µg/ (30 µg))	40(88.88%)	6(100%)	4(80%)	4(80%)	2(100%)
Ciprofloxacin (5 µg)	29(70%)	4(66.67%)	4(80%)	3(60%)	2(100%)
Imipenem (10 µg)	45(100%)	6(100%)	5(100%)	5(100%)	2(100%)
Meropenem (10 µg)	45(100%)	6(100%)	5(100%)	5(100%)	2(100%)

All Gram negative isolates showed 100% sensitivity to imipenem and meropenem. Among Enterobacteriaceae (53), 15 (28.3%) isolates were resistant to 3rd generation cephalosporins. Percentages of ESBL production among 18 isolates were, *E.coli* 50 %, *K. pneumoniae* 24.44% and *Citrobacter* spp 16.67%. Ciprofloxacin sensitivity was 64.44% among *K.pneumoniae* and 66.67 % among *Citrobacter* spp isolates. Gentamycin sensitivity was 68.88% in *K.pneumoniae* and 66.67% in *Citrobacter* spp isolates. Among the nonfermenters, *Acinetobacter* spp showed sensitivity of 60% to ciprofloxacin and 40% to gentamycin when compared to *Pseudomonas* spp that showed a sensitivity of 80% to ciprofloxacin and gentamycin.

Discussion:

In this study, the blood culture positivity rate in clinically suspected septicemia cases was 13.7% which was comparable to the rates reported from other Indian studies 11.2% (Shalini S et al 2010) and 16.5% (Gupta et al 2016). Other studies showed a low prevalence of 8.39 % (Vanitha et al 2012) and 9.94% (Mehta et al 2005) and a high prevalence of 44% (Khanal et al 2002) and 33.9% (Sharma et al 2002). This variation in prevalence may be due to the different methodologies in blood culture processing, patient demographics and over the counter antibiotic intake.

In this study, Gram positive and Gram negative bacteria constituted 58.25% and 41.72% respectively. It conforms to the findings of Sumita et al 2014.

In the percent study *S.aureus* (39.73%) was the most frequently isolated bacteria similar to Asmita et al 2016. *K.pneumonia* (29.8%) was the second common isolate followed by CONS 13.9%, *Enterococcus* spp 4.63%, *Citrobacter* spp 3.97%, *Pseudomonas* spp 3.31% and *Acinetobacter* spp 3.31%. These findings were comparable to the observation of the study conducted in the neonatology ward that showed *Klebsiella* spp (24.6%), CONS (16.6 %) and *Pseudomonas* spp (2.9 %.) (Roy et al). Other studies showed different distribution of bacterial isolates which may be due to the study design, geographical location and difference in blood culture system.

In the present study 21(18.33 %) of *S. aureus* was MRSA similar to Jena et al 2015. All the isolates of *S. aureus* were 100% sensitive to vancomycin as comparable with Rathod et al 2013. The ESBL producing Enterobacteriaceae in our study was 28.3% of which *K. pneumonia* was 24.44% which was similar to the findings of Mahajan DD et al 2016. All our isolates were sensitive to imipenem and meropenem comparable with other studies. (Sumita et al 2014).

Conclusion:

There is an alarming increase of the antibiotic resistance among the blood stream pathogens. Hence routine surveillance of the susceptibility patterns among these isolates will facilitate in

formulating hospital antibiotic policy and in the long run will reduce the burden of multidrug resistance pathogens to the treating clinicians.

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