A study of microbiological profile and antibiotic susceptibility pattern of the organisms isolated from blood stream infection in patients of critical care units in tertiary care hospital in Western India

Hetvi Chawda[1], Madhulika Mistry[2], Twinkal Parmar[3*]

Tutor, Associate Professor, Resident, Dept. of Microbiology, GMERS Medical College and Hospital, Vadnagar, PDU Medical College and Hospital, Rajkot, Gujarat, India

***Corresponding Author: Twinkal Parmar**
Email: drhetvichawda@gmail.com

Abstract
Introduction: BSI is a major cause of mortality in hospitalized patients**.** ICU patients are more likely to acquire nosocomial infections than other hospitalised patients. The nature of ICU environment is such, that makes it a focus for the emergence and spread of antibiotic resistant pathogens.
Aim and Objectives: To Study the spectrum of bacteria causing blood stream infection and their antibiotic susceptibility patterns in patients of critical care units.
Materials and Methods: The study was carried out in the Department of Microbiology, PDU Medical College, Rajkot from January 2018 to June 2018. Blood samples were collected in BHIB and processed for culture on blood agar and MacConkey agar, Gram stain and biochemical tests. Antimicrobial susceptibility testing was performed by modified Kirby Bauer method as per the CLSI guidelines.
Results: 464(29.83%) were isolated from 1555 specimens. Out of these, 443 from NICU, 19 from PICU, 1 from ICCU and 1 from SICU, predominantly males (57.11%). GNB sensitivite to Imipenem (100%), Amikacin (95.67%), followed by Levoflox (95%) and Gentamicin (84.33%) and GPC to Linezolid (100%), Vancomicine (100%) followed by Gentamicin (99%) and Tetracycline (89%). Maximum resistance observed to Cephtazidim, Co-trimoxazole in GNB and Erythromicin, Clindamicin in GPC.
Conclusion: Excessive use of broad spectrum antibiotics, immunocompromised hosts, invasive procedures make the ICU patients susceptible to colonization with highly resistant pathogens. This study helps to know the spectrum of bacteria causing BSIs and will guide the clinicians to use appropriate management strategies and to formulate local antibiotic policy, thereby will help in early cure and reduced hospital stay of the patients.

Keywords: BSI, Blood stream Infection, Blood culture, Neonatal sepsis.

Introduction
Blood Stream Infection (BSI) is a major cause of mortality in hospitalized patients.[1] ICU patients are more prone to acquire Health care associated infections than other hospitalised patients. Blood culture provides essential information for the evaluation of a variety of diseases like endocarditis, pneumonia and pyrexia of unknown origin particularly, in patients with suspected sepsis. Septicemia is one of the leading causes of neonatal mortality along with perinatal hypoxia.

Objectives
To know the prevalence of blood stream infection in Adults, Pediatrics Pediatric age group including neonates admitted in critical care units and also to know the spectrum of bacteria causing blood stream infection in patients of critical care units. To know the antibiotic susceptibility patterns of the isolates causing blood stream infection using Kirby – Bauer disc diffusion method[1].

Materials and Methods
The study was carried out in the Department of Microbiology, PDU Medical College, Rajkot from January 2018 to June 2018. 2 to 5 ml of blood from pediatric patients and 5 to 10 ml of blood from adult patients will be inoculated into the BHIB (Brain Heart Infusion Broth) culture medium bottle.It will be followed up for 7 days by sub culturing the medium on BA (Blood Agar) and Mac conkey Agar. The isolates obtained in positive sub cultures will further be processed for confirmation by gram's stain, oxidase test, catalase test, coagulase test, biochemical reactions using conventional methods. Antibiotic susceptibility of the isolates will be performed by Kirby – Bauer disc diffusion method according to CLSI guidelince.[1]

Results
Four hundred and sixty four strains (29.83%) were isolated from 1555 specimens. Approximately 200,000 cases of bacteraemia occur annually with mortality rates ranging from 20-50%.[2] Predominant isolated organisms in this study were Klebsiella pneumoniae, Escherichia coli, Acinetobacter baumannii, Sthaphylococcus aureus and Pseudomonas aeruginosa. Gender wise distribution of study participants were displayed in figure 1 which shows gender (male:female) ratio was 2:1.5(265 males, 199 females). Predominantly there were males (57.11%) affected. Same ward wise distribution of isolated organisms is displayed in Fig. 2 which shows 443(95.47%) were from NICU, 19 (4.09%) were from PICU, 1(0.22%) were from ICCU and 1(0.22%) were from SICU out of total 464 isolates. Figure 3 shows that Gram-negative rods (most often *Klebsiella* 226

(48.70%), *E.coli* 117(25.21%), *Acinetobacter* 109(23.49%)) have been shown predominate than gram positive organisms (most often *Staphylococcus aureus* 10(2.15%). Table 1, 2 & 3 shows antibiotic sensitivity of Gram negative, Gram positive and Pseudomonas isolates respectively. It represents that Gram negative bacilli (*Klebsiella* 226(48.70%), *E.coli* 117(25.21%), *Acinetobacter* 109(23.49%) are sensitivite to Imipenem (100%), Amikacin (95.67%), followed by Levofloxacin (95%) and Gentamicin (84.33%). Gram positive cocci (Staphylococcus aureus) are sensitive to Linezolid (100%), Vancomycine (100%) followed by Gentamicin (99%) and Tetracycline (89%). Pseudomonas aeruginosa are sensitive to Piperacillin (100%), Gentamicin (100%) followed by Ceftazidim (99%) and Amikacin (98%) and Levofloxacin (96%)

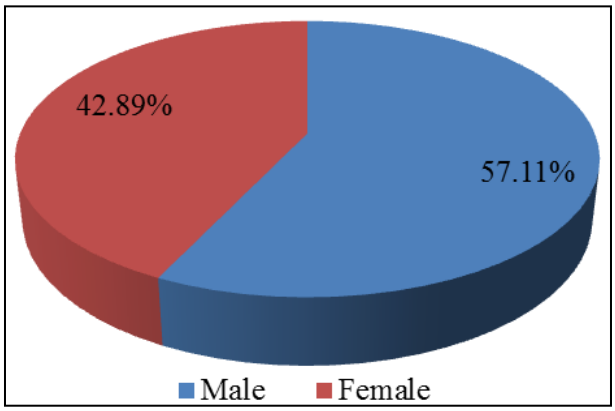

Fig. 1: Gender wise distribution of Positive samples.

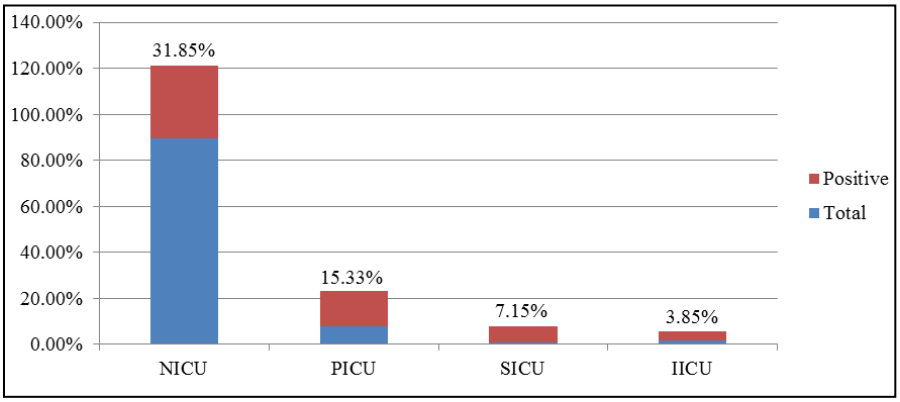

Fig. 2: WARD wise Distributions of positive samples

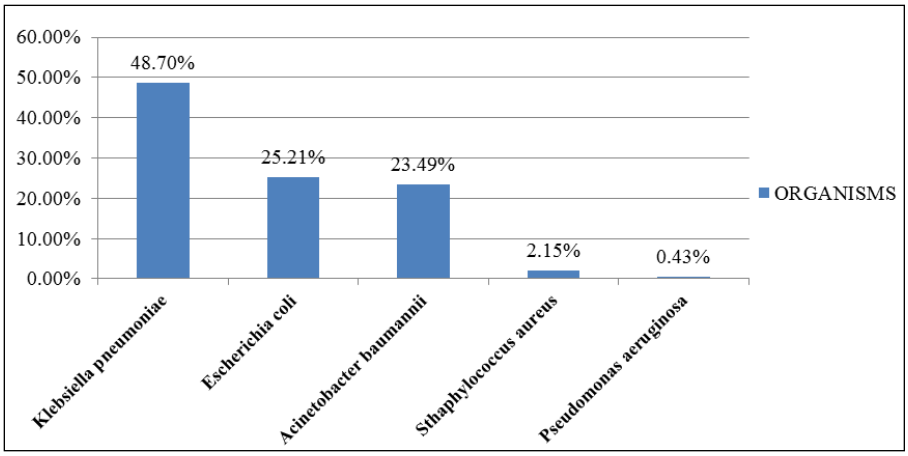

Fig. 3: Organisms wise Distributions of Positive samples

Table 1: Antibiotic Sensitivity Testing of Gram negative isolates

Antibiotic Drugs	Klebsiella pneumoniae	Escherichia coli	Acinetobacter baumannii
	Sensitivity %		
Ampicilin+Salbactum	68	57	68
Amikacin	99	89	99
Gentamicin	84	85	84
Levofloxacin	99	87	99
Ciprofloxacin	99	87	99
Co-trimoxazole	56	64	57
Ampicillin	0	0	0
Imipenam	100	100	100
Ceftazidim	44	44	47
Ceftazidim+Clavulanate	55	50	50
Cefepime	71	60	60
Tetracyclin	82	72	82

Table 2: Antibiotic sensitivity testing of gram

Antibiotic Drugs	S. aureus (Sensitivity%)
Erythromycin	54
Clindamycin	55
Levofloxacin	70
Gentamicin	99
Tetracyclin	89
Cefoxitin	59
Vancomycin	100
Rifampicin	100
Linezolid	100

Positive Isolates

Table 3: Antibiotic Sensitivity Testing of Pseudomonas isolates

Antibiotic Drugs	Pseudomonas aeruginosa (Sensitivity%)
Piperacillin	100
Piperacillin+Tazobactum	100
Gentamicin	100
Levofloxacin	96
Amikacin	98
Polymyxin-B	100
Aztreonam	100
Cefeperazone	94
Ceftazidim	99

Discussion

Approximately 200,000 cases of bacteraemia occur annually with mortality rates ranging from 20-50%.[2] Isolated organisms were Klebsiella pneumoniae, Escherichia coli, Acinetobacter baumannii, Sthaphylococcus aureus, Pseudomonas aeruginosa. In the study of Khatau S.P et al.[7] clinical septicemia developed within 5 days in 70.64 & of cases, between 6 to 10days in 18% of cases and after 10 days in 10.86%of cases.[7] Boo, N.Y et al 128 has observed that more than 50% of neonatal septicemia occurred after the age of two days.[8] The impact of BSIs on mortality and length of hospital stay is controversial, with some studies reporting 10–25% increased in mortality and prolongation of hospital stay, while some other studies report no attributable mortality. (Appelgren *et al.* 2001, Digiovine *et al.*1999, Pittet *et al.* 1994, Renaud *et al.* 2001, Rosenthal *et al.*2003, Soufir *et al.*1999. Gram-negative rods (most often *Klebsiella* 226(48.70%), *E.coli* 117(25.21%), *Acinetobacter* 109(23.49%) have been shown predominate than gram positive organisms (most often *Staphylococcus aureus* 10(2.15%)). (Erbay *et al.* 2003, Vosylius *et al.* 2003).[3] In this study all positive isolates were subject to antibiotic sensitivity testing as per CLSI 2016.[2] Similar kind of antibiotic sensitivity patterns has been found in previous study.[4-6]

Conclusion

Organisms are the "superbugs" of the modern hospital environment causing significant infections in specific patient populations, especially in patients of ICU which are prone to acquire infections. Excessive use of broad spectrum antibiotics, immunocompromised hosts, invasive procedures make the ICU patients susceptible to colonization with highly resistant pathogens. To avoid resistance, antibiotic should be used judiciously and empirical antibiotic therapy should be determined based on local antibiotic sensitivity pattern of the prevalent organism of the hospital. Continued awareness to maintain good housekeeping, equipment decontamination, strict attention to hand washing, isolation procedures and control of antibiotic use, especially in high-risk areas, appear most likely measures to control the spread of Infection in hospitals. This study helps to know the spectrum of bacteria causing BSIs and will guide the clinicians to use appropriate management strategies and to formulate local antibiotic policy, thereby will help in early cure and reduced hospital stay of the patients.

Conflict of Interest: None.

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