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ORIGINAL ARTICLE

ANTIBIOTIC SUSPECTIBILITY PATTERN OF VARIOUS BACTERIAL AND FUNGAL SPECIES ISOLATED FROM BLOOD CULTURE OF CHILDREN- A PROSPECTIVE STUDY

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ABSTRACT:

Background: Early administration of adequate antibiotic therapy has been shown to reduce mortality associated with bloodstream infection and has a positive impact on the outcome of bacteraemic patients. Septic shock is defined as sepsis associated with evidence of organ hypoperfusion and a systolic blood pressure <90 or >30 mm Hg less than the baseline or a requirement for the use of vasopressor to maintain the blood pressure. About 70% of Staphylococci isolated in blood cultures are resistant to Penicillin, the most effective antibiotic against the Staphylococcal isolate is Clindamycin (70%) followed by Vancomycin (40%). The aim of present study is to establish the antibiotic sensitivity pattern amongst various blood culture isolates obtained from neonatal blood cultures. **Materials and methods:** Department of microbiology and department of paediatrics of Integral Institute of Medical Sciences conducted a hospital based study involving 80 children and neonates.The ethical committee clearance was obtained prior to initiating the study and parents of all the subjects were informed about the study and a written consent was obtained from all.By using a sterile syringe blood was drawn through venipuncture before administration of antibiotics. Blood cultures were done by Bactec blood culture technique. Smears were prepared from positive blood cultures and examined. After cultures, bacteria were obtained in pure subcultures. The organism was isolated in pure culture on a solid medium. Isolated colonies was inoculated in a suitable broth medium and incubated at 35-370C for 4-6 hours. The density of the organism in broth was adjusted to approximately106 cfu/ml by comparing it's turbidity with 0.5 McFarland opacity standard tubes. The antimicrobial susceptibility testing was done by Kirby-Bauer's Disk Diffusion. The data thus obtained was arranged in a tabulated form. It was expressed as percentage of the total. **Results:** Out of the total of 80 newborns and children, 40% were females and 60% were males. S.aureus were more sensitive to neticllin, vancomycin, teicoplanin, linezolid & tigecycline(100%) followed by amikacin & tobramycin(93.75%). Coagulase negative Staphylococci was found to be highly sensitive to vancomycin (100%), teicoplanin (100%), linezolid, netillin, tobramycin, tetracycline & tegicycline (100%) followed by clindamicin 80% and complete resistance (100 %) was seen with penicillin while 80% was seen in cefoxitin, amoxyclav, ciprofloxacin & ofloxacin. Candida albicans shows maximum sensitivity pattern to voriconazole (100%), itraconazole, fluconazole (85.71%) followed by amphotercin –B (57.14%). **Conclusion:** Staphylococcus aureus was found to be highly sensitive to vancomycin, teicoplanin, linezolid, netillin & tegicycline. Enterococcus was highly sensitive to tetracycline.E.coli was more sensitive to piperacillin/tazobactam, tegicycline and imipenem/cilastin. Candida albicans shows maximum sensitivity pattern to voriconazole.

Keywords: Antibiotic, bactec, staphyloccus, venipuncture.

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INTRODUCTION

Sepsis is one of the major causes of mortality and morbidity in hospitals. Bloodstream infections affect approximately 2% of all hospitalized patients and up to 70% patients admitted in the Intensive Care Unit.[1,2] Mortality is high, ranging from 14% to 57%.[3] Early administration of adequate antibiotic therapy has been shown to reduce mortality[4,5] and has a positive impact on the outcome of bacteraemic patients[6,7](Harbarth et.al., 2003; Kollef et al., 1999). Kumar et al[5], demonstrated an increase in mortality of 7.6% for every hour by which antimicrobials were delayed in septic shock. The Surviving Sepsis Campaign's 2008 "International guidelines for the management of severe sepsis and septic shock" also recommend that appropriate antimicrobial therapy be administered within 1 hour of recognition of severe sepsis or septic shock .[8]Septic shock is defined as sepsis associated with evidence of organ hypoperfusion and a systolic blood pressure <90 or >30 mm Hg less than the baseline or a requirement for the use of vasopressor to maintain the blood pressure.[9] In worst cases, infection leads to the life-threatening drop in blood pressure called septic shock. This can quickly lead to the failure of several organs such as- lungs, kidney & liver which causing to death.[10]

Various studies have shown that the most common isolate from blood culture is Staphylococcus aureus (70-95%), followed by Staphylococcus Coagulase. About 70% of Staphylococci are resistant to Penicillin, the most effective antibiotic against the Staphylococcal isolate is Clindamycin (70%) followed by Vancomycin (40%).[11]

Co-trimoxazole is resistant in Klebsiella. Multiple drug resistance is seen in Enterobacter, E.coli, Klebsiella, and Salmonella species. In case of Gram-positive isolates, penicillin resistant was noted in 80% cases, which is a primary drug against Gram-positive organisms. Resistance to macrolides is also increasing. Increased resistance has been noticed against amikacin and gentamycin, which are commonly used for empirical therapy. Studies have reported that 85% of E. coli isolates were resistant to ampicillin[12,13]. The aim of present study is to establish the antibiotic sensitivity pattern amongst various blood culture isolates obtained from neonatal blood cultures.

MATERIALS AND METHODS

Department of microbiology and department of paediatrics of Integral Institute of Medical Sciences conducted a hospital based study involving 80 children and neonates. This study was conducted from January 2016- june 2016. High risk neonates and children with subjective signs and symptoms of blood stream infection were included in this study. The ethical committee clearance was obtained prior to initiating the study and parents of all the subjects were informed about the study and a written consent was obtained from all. Those parents's who didn't give the written consent were not included in the study. Appropriate verification of the patient's identity, age, sex, and address was done before the specimen collection. Skin over the vein was disinfected by 70% isopropyl alcohol for preventing contamination. By using a sterile syringe blood was drawn through venipuncture before administration of antibiotics. Blood cultures were done by Bactec blood culture technique. Smears were prepared from positive blood cultures and examined. After cultures, bacteria were obtained in pure subcultures. The organism was isolated in pure culture on a solid medium. Isolated colonies was inoculated in a suitable broth medium and incubated at 35-370C for 4-6 hours. The density of the organism in broth was adjusted to approximately106 cfu/ml by comparing it's turbidity with 0.5 McFarland opacity standard tubes.

The antimicrobial susceptibility testing was done by Kirby-Bauer's Disk Diffusion Method on Mueller Hinton Agar and interpreted as per Clinical Laboratory Standard Institution guidelines (CLSI M100 S25., 2015) and antibiotics disk was use according to bacterial isolate. Mueller Hinton Agar was used for testing aerobes. The media was prepared in a petridish (9 cm in diameter). The depth of the media was 4 mm (approx 25ml). Commercially available antibiotics disk of 6mm was used.

Drugs Tested:

Staphylococcus species were tested for following antibiotics. Penicillin (10units), Ampicillin/ Sulbactam (10/10µg), Amoxyclav (20/10µg), Co-trimoxazole (25µg), Tetracycline (30µg), Cefprozil (30µg), Cefaclor (30µg), Cefoxitin (30µg), Gentamicin (10µg), Amikacin (30µg), Netillin (30µg), Tobramycin (30µg), Erythromycin (30µg), Ciprofloxacin (5µg), Levofloxacin (5µg), Ofloxacin (5µg), Clindamycin (30µg), Vancomycin (30µg), Teicoplanin (30µg), Linezolid (15µg) & Tegicycline (15µg).

For Enterococcus species, the following antibiotics were tested. Penicillin(10units), Ampicillin(10µg), Tetracycline(30µg), High level Gentamicin(120µg), High level streptomycin(300µg), Amikacin(30µg), Ciprofloxacin(5µg), Levofloxacin(5µg), Ofloxacin(5µg), Doxycycline(30µg), Vancomycin(30µg), Teicoplanin(30µg), Linezolid(15µg).

Enterobactericaeae were tested for following – Ampicillin (10µg),Ampicillin/Sulbactam (10/10µg), Amoxycillin/ Clavulanic Acid (20/10µg), Ticarcillin/ Clavulanic Acid (75/10µg), Piperacillin/ Tazobactam (100/10µg), Cefoxitin (30µg), Cefuroxime (30µg), Ceftazidime (30µg), Ceftazidime/ Clavulanic Acid (30/10µg), Cefixime (5µg), Ceftriaxone (30µg), Ceftriaxone/ Sulbactam (30/10µg), Cefotaxime (30µg), Cefotaxime/ Clavulanic Acid (30/10µg), Cefepime (30µg), Tetracycline (30µg), Tegicycline (15µg), Gentamicin (10µg), Amikacin (30µg), Ciprofloxacin (5µg), Ofloxacin (5µg), Levofloxacin (5µg), Tobramycin (10µg), Cloramphenicol (30µg), Co-trimoxazole (25µg), Netillin (30µg), Azetronam (30µg), Imipenem/Cilastatin (10/10µg), Meropenem (10µg) & Ertapenem (10µg).

Candida species were tested for following- Fluconazole (25 µg), Voriconazole (1µg), Itraconazole (30 µg), Amphotericin-B (50µg).

Procedure- A cotton swab was dipped in inoculum and inoculated swab was streaked three times on entire agar surface. Seven disks of antibiotics were applied on a plate of 9cm diameter plate.After overnight incubation the result was interpreted by comparing the zone of inhibition of control and test bacterium. The zone size was measured in mm from edge of the disks. It was interpreted as Sensitive(S), Intermediate sensitive (I) and Resistant(R).[14]

Statistical analysis: The data thus obtained was arranged in a tabulated form. It was expressed as percentage of the total. Chi square test was the test of significance that was used and p value of less than 0.05 was considered significant.

RESULTS

Out of the total of 80 newborns and children, 40% were females and 60% were males. There were 41 positive cultures and 34 sterile cultures. Out the total positive cultures, 25 were that amongst males and 15 amongst females. According to Kuppu swami, out of 80 subjects, 39 subjects belonged to middle class whose score was between the range of 11-15, 33 subjects had score ≤5 belonged to lower class and only 08 subjects belonged to upper class & their score was 16-25. Amongst the isolates, 16 were those of staphylococcus aureus, 5 of CONS, 3 of enterococci, 4 of escherchia coli, 3 of kleibsella pneumonia, 1 of acinetobactor, 1 of citrobactor, 7 of candida abicans species and 1 of non albicans candid species.

Table 1 shows the antibiotic suspectibility pattern of staphylococcus aureus. S.aureus were more sensitive to

neticllin, vancomycin, teicoplanin, linezolid & tigecycline(100%) followed by amikacin & tobramycin(93.75%). It were more resistant to co-trimoxazole (87%) followed by penicillin, cefoxitin (81.25%, 75%) respectively

Table 2 demonstrates the antibiotic susceptibility pattern of Coagulase negative staphylococci. Coagulase negative Staphyolococci was found to be highly sensitive to vancomycin (100%), teicoplanin(100%), linezolid, netillin, tobramycin, tetracycline & tegicycline (100%) followed by clindamicin 80% and complete resistance (100 %) was seen with penicillin while 80% was seen in cefoxitin, amoxyclav, ciprofloxacin & ofloxacin.

Table 3 illustrates the antibiotic susceptibility pattern of Enterococcus species. Enterococcus was highly sensitive to tetracycline(100%) followed by levofloxacin(50%) and high level streptomycin while it revealed maximum resistant to penicillin, ampicillin, vancomycin, high level gentamicin, amikacin, ciprofloxacin & ofloxacin(66.66%) and it was intermediate to amikacin as well as teicoplanin (33.33%).

Table 4 shows the antibiotic susceptibility pattern of Escherichia coli. E.coli was more sensitive to piperacillin/tazobactam, tegicycline and imipenem/cilastin (100%) followed by netillin (33.33%) whereas it revealed 100% resistant to ampicillin, ampicillin/sulbactam, ticarcillin/tazobactam, cefoxitin, cefuroxime, ceftazidime, ceftriaxone, cefotaxime, cefixime, cefepime, ofloxacin, levofloxacin , azetronam and ertapenem. Table 5 shows the antibiotic susceptibility pattern of Klebsiella Species. Klebsiella was more sensitive to imipenem/cilastin (100%) followed by tegicycline, tetracycline and meropenem (75%) whereas it revealed 100% resistant to ampicillin, ampicillin/sulbactam, amoxyclav, ticarcillin/tazobactam, cefoxitin, cefuroxime, ceftazidime, ceftazidime/ clavulanic acid, ceftriaxone, ceftriaxone/sulbactam, cefotaxime, cefotaxime/clavulanic acid, cefixime, cefepime, ciprofloxacin, ofloxacin, levofloxacin, tobramycin, cloramphenicol, co-trimoxazole, gentamicin, amikacin, netillin, azetronam and ertapenem followed by tetracycline(25%). Intermediate to tegicycline and meropenem(75%).

Table 6 iilustrates antibiotic susceptibility pattern of Acinetobacter species. Maximum number (100%) of sensitivity to ampicillin/sulbactam, imipenem/cilastatin, tegicycline and ertapenem while it shows 100% resistance pattern to ampicillin, amoxyclav, ticarcillin/ clavulanic acid, piperacillin/tazobactam, cefoxitin, cefuroxime, ceftazidime, ceftazidime/clavulanic acid, ceftriaxone, ceftriaxone/sulbactam, cefotaxime, cefotaxime/clavulanic acid, cefixime, cefepime, ciprofloxacin, ofloxacin, tobramycin, cloramphenicol, co-trimoxazole, gentamicin, amikacin, netillin, azetronam and ertapenem. 100% intermediate to levofloxacin and meropenem.

Table 7 demonstrates the antibiotic susceptibility pattern of Citrobacter species.

Maximum number (100%) of sensitivity to ampicillin/sulbactam, imipenem /cilastatin and tigecycline while it shows 100% resistance pattern to ampicillin, amoxyclav, ticarcillin/tazobactam, piperacillin/tazobactam, cefoxitin, cefuroxime, ceftazidime, ceftazidime/clavulanic acid, ceftriaxone, ceftriaxone/sulbactam, cefotaxime, cefotaxime/clavulanic acid, cefixime, cefepime, ciprofloxacin, levofloxacin, tobramycin, cloramphenicol, co-trimoxazole, gentamicin, amikacin, netillin, azetronam, meropenem and ertapenem. 100% intermediate to ofloxacin.

Table 8 shows the antibiotic susceptibility pattern of Candida albicans. Candida albicans shows maximum sensitivity pattern to voriconazole (100%), itraconazole, fluconazole (85.71%) followed by amphotercin –B (57.14%).

Table 9 illustrates the antibiotic susceptibility pattern of Non- albicans Candida. Maximum sensitivity pattern showed to itraconazole, fluconazole, amphotercin –B (100%) and it revealed intermediate to voriconazole (100%).

Table 1: Antibiotic susceptibility pattern of Staphylococcus aureus

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Penicillin(P)	13 (81.25%)	31(8.75%)	0 (0%)
Ampicillin/Sulbactam (A/S)	9 (56.24%)	6 (37.5%)	1 (6.25%)
Amoxyclav (AMC)	12 (75%)	3 (18.75%)	1 (6.25%)
Cotrimoxazole (COT)	14 (87.5%)	2 (12.5%)	0 (0%)
Tetracycline (TE)	2 (14.28%)	11 (78.57%)	1 (6.25%)
Cefprozil(CFR)	10 (62.5%)	5 (31.25%)	1 (6.25%)
Cefaclor(CF)	10 (62.5%)	6 (37.5%)	0 (0%)
Cefoxitin(CX)	12 (75%)	4 (25%)	0 (0%)
Gentamicin(GEN)	1 (6.25%)	14 (87.5%)	1 (6.25%)
Amikacin(AK)	0 (0%)	15 (93.75%)	1 (6.25%)
Tobramycin(TOB)	1 (6.25%)	15 (93.75%)	0 (0%)
Netillin(NET)	0 (0%)	15 (100%)	0 (0%)
Ciprofloxacin (CIP)	9 (56.25%)	5 (31.25%)	2 (12.5%)
Ofloxacin (OF)	9 (60%)	3 (20%)	3 (20%)
Levofloxacin (LE)	4 (25%)	7 (43.75%)	5 (31.25%)
Gemifloxacin(GEM)	2 (12.5%)	9 (56.25%)	5 (31.25%)
Clindamycin (CD)	3 (18.75%)	13 (81.25%)	0 (0%)
Erythromycin (E)	3 (33.33%)	4 (44.44%)	2 (22.22%)
Vancomycin (VA)	0 (0%)	16 (100%)	0 (0%)
Linezolid (LI)	0 (0%)	16 (100%)	0 (0%)
Teicoplanin(TEI)	0 (0%)	16 (100%)	0 (0%)
Tigecycline (TG)	0 (0%)	16 (100%)	0 (0%)

Table 2: Antibiotic susceptibility pattern of Coagulase negative staphylococci

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Penicillin(P)	5 (100%)	0 (0%)	0 (0%)
Ampicillin/Sulbactam (A/S)	3 (60%)	2 (40%)	0 (0%)
Amoxyclav (AMC)	4 (80%)	1 (20%)	0 (0%)
Cotrimoxazole (COT)	3 (60%)	2 (40%)	0 (0%)
Tetracycline (TE)	0 (0%)	4 (100%)	0 (0%)
Cefprozil(CFR)	3 (60%)	1 (20%)	1 (20%)
Cefaclor(CF)	3 (60%)	2 (40%)	0 (0%)
Cefoxitin(CX)	4 (80%)	0 (0%)	1 (20%)
Gentamicin(GEN)	1 (20%)	4 (80%)	0 (0%)
Amikacin(AK)	0 (0%)	4 (80%)	1 (20%)
Tobramycin(TOB)	0 (0%)	5 (100%)	0 (0%)
Netillin(NET)	0 (0%)	3 (100%)	0 (0%)
Ciprofloxacin (CIP)	4 (80%)	1 (20%)	0 (0%)
Ofloxacin (OF)	4 (80%)	0 (0%)	1 (20%)
Levofloxacin (LE)	1 (25%)	1 (25%)	2 (50%)
Gemifloxacin(GEM)	0 (0%)	3 (75%)	1 (25%)
Clindamycin (CD)	1 (20%)	4 (80%)	0 (0%)
Erythromycin (E)	2 (50%)	0 (0%)	2 (50%)
Vancomycin (VA)	0 (0%)	5 (100%)	0 (0%)
Linezolid (LI)	0 (0%)	5 (100%)	0 (0%)
Teicoplanin(TEI)	0 (0%)	5 (100%)	0 (0%)
Tigecycline (TG)	0 (0%)	5 (100%)	0 (0%)

Table 3: Antibiotic susceptibility pattern of Enterococcus species

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Penicillin (P)	2 (66.66%)	1 (33.33%)	0 (0%)
Ampicillin (AMP)	2 (66.66%)	1 (33.33%)	0 (0%)
Tetracycline (TE)	0 (0%)	3 (100%)	0 (0%)
High level Gentamicin(HLG)	2 (66.66%)	1 (33.33%)	0 (0%)
High level Streptomycin (HLS)	0 (0%)	3 (100%)	0 (0%)
Amikacin(AK)	2 (66.66%)	0 (0%)	1 (33.33%)
Ciprofloxacin (CIP)	2 (66.66%)	1 (33.33%)	0 (0%)
Ofloxacin(OF)	2 (66.66%)	1 (33.33%)	0 (0%)
Levofloxacin (LE)	1 (50%)	1 (33.33%)	0 (0%)
Doxycycline (DO)	0 (0%)	3 (100%)	0 (0%)
Linezolid(LI)	0 (0%)	3 (100%)	0 (0%)
Vancomycin (V)	2 (66.66%)	1 (33.33%)	0 (0%)
Teicoplanin (TEI)	1 (33.33%)	1 (33.33%)	1 (33.33%)

Table 4: Antibiotic susceptibility pattern of Escherichia coli

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Ampicillin(AMP)	4 (100%)	0 (0%)	0 (0%)
Ampicillin/sulbactam (A/S)	4 (100%)	0 (0%)	0 (0%)
Amoxyclav(AMC)	4 (100%)	0 (0%)	0 (0%)
Ticarcillin/clavulanic acid (TCC)	4 (100%)	0 (0%)	0 (0%)
Piperacillin/Tazobactam (PIT)	0 (0%)	4 (100%)	0 (0%)
Cefoxitin (CX)	4 (100%)	0 (0%)	0 (0%)
Cefuroxime (CXM)	4 (100%)	0 (0%)	0 (0%)
Ceftazidime(CAZ)	4 (100%)	0 (0%)	0 (0%)
Ceftazidime/clavulanic acid (CAC)	3 (75%)	1 (25%)	0 (0%)
Ceftriaxone(CTR)	4 (100%)	0 (0%)	0 (0%)
Ceftriaxone/ Sulbactam (CIS)	3 (75%)	1 (25%)	0 (0%)
Cefotaxime (CTX)	4 (100%)	0 (0%)	0 (0%)
Cefotaxime/clavulanic acid (CEC)	3 (75%)	1 (25%)	0 (0%)
Cefixime (CFM)	4 (100%)	0 (0%)	0 (0%)
Cefepime (CPM)	4 (100%)	0 (0%)	0 (0%)
Tetracycline (TE)	2 (50%)	1 (25%)	1 (25%)
Tigecycline (TG)	0 (0%)	4 (100%)	0 (0%)
Gentamicin (GM)	3 (75%)	0 (0%)	1 (25%)
Amikacin(AK)	3 (75%)	1 (25%)	0 (0%)
Ciprofloxacin (CIP)	3 (75%)	0 (0%)	1 (25%)
Ofloxacin (OF)	4 (100%)	0 (0%)	0 (0%)
Levofloxacin (LE)	4 (100%)	0 (0%)	0 (0%)
Tobramycin (TOB)	3 (75%)	1 (25%)	0 (0%)
Chloramphenicol (C)	3 (75%)	0 (0%)	1 (25%)
Trimethoprim/Sufamethoxazole(COT)	3 (75%)	1 (25%)	0 (0%)
Netillin (NET)	1 (33.33%)	1 (33.33%)	1 (33.33%)
Aztreonam (AT)	4 (100%)	0 (0%)	0 (0%)
Imipenam/Cilastatin (IC)	0 (0%)	4 (100%)	0 (0%)
Meropenem (MRP)	2 (50%)	0 (0%)	2(50%)
Ertapenam (ETP)	4 (100%)	0 (0%)	0 (0%)

Table 5: Antibiotic susceptibility pattern of Klebsiella Species

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Ampicillin(AMP)	3 (100%)	0 (0%)	0 (0%)
Ampicillin/sulbactam (A/S)	3 (100%)	0 (0%)	0 (0%)
Amoxyclav(AMC)	3 (100%)	0 (0%)	0 (0%)
Ticarcillin/clavulanicacid (TCC)	3 (100%)	0 (0%)	0 (0%)
Piperacillin/Tazobactam (PIT)	3 (100%)	0 (0%)	0 (0%)
Cefoxitin (CX)	3 (100%)	0 (0%)	0 (0%)
Cefuroxime (CXM)	3 (100%)	0 (0%)	0 (0%)
Ceftazidime(CAZ)	3 (100%)	0 (0%)	0 (0%)
Ceftazidime/clavulanic acid (CAC)	3 (100%)	0 (0%)	0 (0%)
Ceftriaxone(CTR)	3 (100%)	0 (0%)	0 (0%)
Ceftriaxone/ Sulbactam (CIS)	3 (100%)	0 (0%)	0 (0%)
Cefotaxime (CTX)	3 (100%)	0 (0%)	0 (0%)
Cefotaxime/clavulanic acid (CEC)	3 (100%)	0 (0%)	0 (0%)
Cefixime (CFM)	3 (100%)	0 (0%)	0 (0%)
Cefepime (CPM)	3 (100%)	0 (0%)	0 (0%)
Tetracycline (TE)	1 (25%)	2 (75%)	0 (0%)
Tigecycline (TG)	0 (0%)	2 (75%)	1 (25%)
Gentamicin (GM)	3 (100%)	0 (0%)	0 (0%)
Amikacin(AK)	3 (100%)	0 (0%)	0 (0%)
Ciprofloxacin (CIP)	3 (100%)	0 (0%)	0 (0%)
Ofloxacin (OF)	3 (100%)	0 (0%)	0 (0%)
Levofloxacin (LE)	3 (100%)	0 (0%)	0 (0%)
Tobramycin (TOB)	3 (100%)	0 (0%)	0 (0%)
Chloramphenicol (C)	3 (100%)	0 (0%)	0 (0%)
Trimethoprim/Sufamethoxazole(COT)	3 (100%)	0 (0%)	0 (0%)
Netillin (NET)	3 (100%)	0 (0%)	0 (0%)
Aztreonam (AT)	3 (100%)	0 (0%)	0 (0%)
Imipenam/Cilastatin (IC)	0 (0%)	3 100%)	0 (0%)
Meropenem (MRP)	0 (0%)	2 (75%)	1(25%)
Ertapenam (ETP)	3 (100%)	0 (0%)	0 (0%)

Table 6: Antibiotic susceptibility pattern of Acinetobacter species

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Ampicillin(AMP)	1 (100%)	0 (0%)	0 (0%)
Ampicillin/sulbactam (A/S)	0 (0%)	1 (100%)	0 (0%)
Amoxyclav(AMC)	1 (100%)	0 (0%)	0 (0%)
Ticarcillin/clavulanic acid (TCC)	1 (100%)	0 (0%)	0 (0%)
Piperacillin/Tazobactam (PIT)	0 (0%)	0 (0%)	0 (0%)
Cefoxitin (CX)	1 (100%)	0 (0%)	0 (0%)
Cefuroxime (CXM)	1 (100%)	0 (0%)	0 (0%)
Ceftazidime(CAZ)	1 (100%)	0 (0%)	0 (0%)
Ceftazidime/clavulanic acid (CAC)	1 (100%)	0 (0%)	0 (0%)
Ceftriaxone(CTR)	1 (100%)	0 (0%)	0 (0%)
Ceftriaxone/ Sulbactam (CIS)	1 (100%)	0 (0%)	0 (0%)
Cefotaxime (CTX)	1 (100%)	0 (0%)	0 (0%)
Cefotaxime/clavulanic acid (CEC)	1 (100%)	0 (0%)	0 (0%)
Cefixime (CFM)	1 (100%)	0 (0%)	0 (0%)
Cefepime (CPM)	1 (100%)	0 (0%)	0 (0%)
Tetracycline (TE)	1 (100%)	0 (0%)	0 (0%)
Tigecycline (TG)	0 (0%)	1 (100%)	0 (0%)
Gentamicin (GM)	1 (100%)	0 (0%)	0 (0%)
Amikacin(AK)	1 (100%)	0 (0%)	0 (0%)
Ciprofloxacin (CIP)	1 (100%)	0 (0%)	0 (0%)
Ofloxacin (OF)	1 (100%)	0 (0%)	0 (0%)
Levofloxacin (LE)	0 (0%)	0 (0%)	1 (100%)
Tobramycin (TOB)	1 (100%)	0 (0%)	0 (0%)
Chloramphenicol (C)	1 (100%)	0 (0%)	0 (0%)
Trimethoprim/Sufamethoxazole(COT)	1 (100%)	0 (0%)	0 (0%)
Netillin (NET)	1 (100%)	0 (0%)	0 (0%)
Aztreonam (AT)	1 (100%)	0 (0%)	0 (0%)
Imipenam/Cilastatin (IC)	0 (0%)	1 (100%)	0 (0%)
Meropenem (MRP)	0 (0%)	0 (0%)	1 (100%)
Ertapenam (ETP)	0 (0%)	1 (100%)	0 (0%)

Table 7: Antibiotic susceptibility pattern of Citrobacter species

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Ampicillin(AMP)	1 (100%)	0 (0%)	0 (0%)
Ampicillin/sulbactam (A/S)	0 (0%)	1 (100%)	0 (0%)
Amoxyclav(AMC)	1 (100%)	0 (0%)	0 (0%)
Ticarcillin/clavulanic acid (TCC)	1 (100%)	0 (0%)	0 (0%)
Piperacillin/Tazobactam (PIT)	0 (0%)	1 (100%)	0 (0%)
Cefoxitin (CX)	1 (100%)	0 (0%)	0 (0%)
Cefuroxime (CXM)	1 (100%)	0 (0%)	0 (0%)
Ceftazidime(CAZ)	1 (100%)	0 (0%)	0 (0%)
Ceftazidime/clavulanic acid (CAC)	1 (100%)	0 (0%)	0 (0%)
Ceftriaxone(CTR)	1 (100%)	0 (0%)	0 (0%)
Ceftriaxone/ Sulbactam (CIS)	1 (100%)	0 (0%)	0 (0%)
Cefotaxime (CTX)	1 (100%)	0 (0%)	0 (0%)
Cefotaxime/clavulanic acid (CEC)	1 (100%)	0 (0%)	0 (0%)
Cefixime (CFM)	1 (100%)	0 (0%)	0 (0%)
Cefepime (CPM)	1 (100%)	0 (0%)	0 (0%)
Tetracycline (TE)	1 (100%)	0 (0%)	0 (0%)
Tigecycline (TG)	0 (0%)	1 (100%)	0 (0%)
Gentamicin (GM)	1 (100%)	0 (0%)	0 (0%)
Amikacin(AK)	1 (100%)	0 (0%)	0 (0%)
Ciprofloxacin (CIP)	1 (100%)	0 (0%)	0 (0%)
Ofloxacin (OF)	0 (0%)	0 (0%)	1 (100%)
Levofloxacin (LE)	0 (0%)	1 (100%)	0 (0%)
Tobramycin (TOB)	1 (100%)	0 (0%)	0 (0%)
Chloramphenicol (C)	1 (100%)	0 (0%)	0 (0%)
Trimethoprim/Sufamethoxazole(COT)	0 (0%)	0 (0%)	1 (100%)
Netillin (NET)	1 (100%)	0 (0%)	0 (0%)
Aztreonam (AT)	1 (100%)	0 (0%)	0 (0%)
Imipenam/Cilastatin (IC)	0 (0%)	1 (100%)	0 (0%)
Meropenem (MRP)	1 (100%)	0 (0%)	0 (0%)
Ertapenam (ETP)	1 (100%)	0 (0%)	0 (0%)

Table 8: Antibiotic susceptibility pattern of Candida albicans

DRUGS	RESISTANCE	INTERMEDIATE	SENSITIVE
Amphotericin B	3 (42.85%)	0(0%)	4(57.14%)
Voriconazole	0(0%)	0 (0%)	7(100%)
Itraconazole	0(0%)	1(14.28%)	6(85.71%)
Fluconazole	0(0%)	1(14.28%)	6(85.71%)

Table 9: Antibiotic susceptibility pattern of Non- albicans Candida

DRUGS	RESISTANCE	SENSITIVE	INTERMEDIATE
Amphotericin B	0 (0%)	1 (100%)	0 (0%)
Voriconazole	0 (0%)	0 (0%)	1 (100%)
Itraconazole	0 (0%)	1 (100%)	0 (0%)
Fluconazole	0 (0%)	1 (100%)	0 (0%)

DISCUSSION

The incidence of neonatal sepsis is increasing day by day. In a study by Shaw et al, he concluded that blood stream infections are the most frequent and leading cause of mortality and morbidity. The causative organism responsible for sepsis varied from place to place and in different hospital settings. In our study 51.21% blood cultures were positive but in a study by Mehmood et al[15] the percentage was quite less i.e. 4.76% whereas the percentage rose to 54.54% in a study by Shaw.[16]

The antibiotic sensitivity and resistance patterns of gram-positive organisms were obtained from the laboratory reports. Staphylococcus aureus was found to be highly sensitive to vancomycin (100%), teicoplanin (100%), linezolid, netillin & tegicycline (100%) followed by tobramycin &amikacin(93.75%), amikacin (87.5%) and clindamycin (81%),tetracycline(78%). Maximum resistant were seen with cotrimoxazole (87.5%) followed by penicillin (81.25%), cefoxitin & amoxyclav (75%), ofloxacin (60%) and ciprofloxacin & ampicillin/sulbactam (56.25%) & also maximum intermediate was tetracycline (78%). Coagulase negative staphyolococci was found to be highly sensitive to vancomycin (100%), teicoplanin(100%), linezolid, netillin, tobramycin, tetracycline & tegicycline (100%) followed by clindamicin 80% and resistant developed 100 % in penicillin ,(80%) in cefoxitin, amoxyclav, ciprofloxacin & ofloxacin.

Among various species of Enterococcus, E.feacalis and E. faecium are the most common human pathogens. Serious enterococcal infections were often difficult to treat since the organisms exhibited intrinsic resistance to penicillinase susceptible penicillin (low level), penicillinase resistant penicillins, cephalosporins,

lincosamides, nalidixic acid, low level of aminoglycoside and low level of clindamycin. They had a tremendous capacity to acquire resistance to penicillin by β-lactamases, vancomycin, chloramphenicol, erythromycin, high level of clindamycin, high level aminoglycosides (HLAR), tetracycline and fluroquinolone, thus drastically limiting therapeutic options.[17,18] Vancomycin resistant Enterococci (VRE) sepsis is emerging as a significant problem in the intensive care setting. The infection can be acquired from the carrier mother or as cross infection from the hospital (nosocomial)[19] .

In gram-negative organisms, the sensitivity patterns of various isolates were as follows: E.coli was highly sensitive to piperacillin/tazobactam (100%), tegicycline & imipenem/cilastin(100%).E.coli develop 100% resistance against these antibiotics were-ampicillin, ampicillin/sulbactam, amoxyclav, ticarcillin/clavulanic acid, cefoxitin, cefuroxime, ceftazidime, ceftriaxone, cefotaxime, cefexime, cefepime, ofloxacin, levofloxacin, azetronam, ertapenem. Meropenem was resistant &intermediate 50% respectively. Maximum sensitivity pattern in bacterial isolate Citrobacter were in ampicillin/sulbactam, tegicycline, imipenem/cilastin, piperacillin tazobactam(100%). Rest all the antibiotics revealed resistance patterns in Citrobacter. In K. pneumoniae, an increase in resistance to 3GC, piperacillin–tazobactum and carbapenem was observed. Various studies have reported anincrease in the incidence of multi-drug resistant E. coli. In the SMART study conducted in Asia Pacific region, the ESBL rate in India amongst E. coli was also alarmingly high (79%). In a study by Sanghamitra et al, K. pneumoniae demonstrated a significant increase in resistance to cefotaxime, carbapenems and piperacillin-tazobactum over the years.

In the present study here, we have found 7(8.75%) isolates were of Candida albicans while only one isolate was of non albicans candida. Candida albicans were 100% sensitive to voriconazole followed by itraconazole, fluconazole (85.7%) but 57% sensitive to amphotericinB. Resistance was only seen to amphotericinB (42.85%). In case of non albicanscandida the highest sensitivity was seen to amphotericinB, itraconazole, fluconazole (100%). A study done by Verma et al, from SGPGI in Lucknow, they ranked Candida species eighth among all isolates from BSI. This study reported an incidence rate of 1.61 per 1000 hospital admissions for candidemia. In other study from AIIMS, New Delhi, found a prevalence rate of 6% for Candida species in a 5year study (2001-2005).[20]

CONCLUSION

Determination of antibiotic sensitivity pattern plays a key role in curing blood stream infections.From the above study we can conclude that Staphylococcus aureus was found to be highly sensitive to vancomycin , teicoplanin , linezolid, netillin & tegicycline. Enterococcus was highly sensitive to tetracycline.E.coli was more sensitive to piperacillin/tazobactam, tegicycline and imipenem/cilastin. Candida albicans shows maximum sensitivity pattern to voriconazole

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