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Research Article

Antibiotic sensitivity and resistance pattern for neonatal sepsis in Klebsiella and Pseudomonas isolated pathogens in neonatal intensive care unit at tertiary care hospital

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ABSTRACT

Background: Neonatal sepsis being one of the major causes for mortality and morbidity in the neonatal intensive care unit (NICU), inadvertent use of antibiotics has led to the emergence of multidrug resistant.
Methods: This cross sectional study was conducted between May 2015 to July 2015 in NICU at BTGH. 3 months lab reports were analysed for growth and sensitivity and resistance pattern of commonly used antibiotics.
Results: Among 75 cases sent for lab investigation, 58 blood cultures were positive for sepsis and showed growth on culture plate of which 13 (22.4%) were positive for pseudomonas and 19 (32.7%) positive for klebsiella. Meropenem 13 (100%) Piperacillin+TZ and Ceftazidime both 11 (84.6%) were highly sensitive for pseudomonas while Meropenem 18 (94.7%) and Imipenem 12 (63.15%) were highly sensitive for klebsiella. Amoxicillin showed highest resistance for both the pathogens.
Conclusions: The results obtained from this study done to evaluate the pattern of antibiotic sensitivity and resistance for neonatal sepsis in klebsiella and pseudomonas isolated pathogens showed that Meropenem as highly sensitive antibiotic and Amoxicillin as highly resistant antibiotic, hence they must be judiciously used to minimize the morbidity and mortality and also to reduce the emergence of multidrug resistant organisms in NICU.

Keywords: Pseudomonas, Klebsiella, Blood culture, Resistance, Meropenem, NICU

INTRODUCTION

Neonatal septicemia describes any systemic bacterial infection in neonates documented by positive blood culture. It is an important cause of morbidity and mortality among neonates generally.[1]

We live in world which is heavily populated by microorganisms of astonishing diversity. In this environment the paediatrics group populations are commonly affected by various infectious diseases. Antibiotics are commonly prescribed to treat various infectious conditions.[2,3] Several studies reported that 50% to 85% of children receive antibiotics in developed and developing countries.[4] Antibiotics are the commonest drugs used in the NICU and have undoubtedly played a role in their improved survival.[5] Poor choice and inadvertent use of broad-spectrum antibiotics has led to the emergence of multidrug resistant gram-negative bacteria.[6]

Health care associated infections are an important problem in neonatal intensive care unit (NICU) in which environmental and host factors often contribute to higher rates of infections. Infections with Gram Negative Bacilli that are resistant to many commonly used antibacterial drugs are increasing reported in NICUs.[7]

Pseudomonas and Klebsiella species are the leading causes of neonatal sepsis hence the present study was undertaken to describe the role of Pseudomonas and Klebsiella in neonatal septicemia along with

antimicrobial susceptibility and resistance pattern of isolation organisms.

METHODS

This cross sectional study was conducted between May 2015 to July 2015 in NICU of tertiary care hospital BTGH, M. R. Medical College, Kalaburagi, Karnataka, India. 3 months lab reports of blood samples sent for assessing growth, sensitivity and resistance pattern of commonly used antibiotics were thoroughly analysed.

Blood Culture: The skin of venepuncture site was disinfected. 1ml blood was drawn an inoculated in Brain Heart Infusion broth, after inoculation, the blood culture bottles were examined for any macroscopic evidence of growth every day for 7 days. The first subculture was done after 6-17 hours, thereafter on the 3rd and finally on the 5th day. Subcultures were done onto Mac Conkey agar, Blood agar, Nutrient agar and chocolate agar plates. The inoculated plates were incubated at 37 ^{o}C for 24 hours and observed for any growth. Positive growth was identified on the basis of colony characteristics

Antibiotic susceptibility testing

Antibiotic susceptibility testing was done for the isolates on Muller-Hinton agar using commercially available discs (Hi Media) by Kirby-Bauer disc diffusion method, using CLSI guidelines for interpretation. Every batch of Mueller-Hilton agar and antibiotic discs were tested by using ATCC control strains.

Inclusion criteria

NICU patients with neonatal sepsis whose samples were positive for growth of organisms.

Exclusion criteria

OPD patients and those admitted in PICU were excluded from the study.

Ethics committee approval was obtained from the Institutional Ethics Committee.

The data that was obtained was thus analysed and presented as percentages using descriptive statistics.

RESULTS

Out of 100 NICU cases 85 cases were documented, 75 cases samples were sent for lab investigation and culture and sensitivity reporting. About 58 (77.33%) blood culture which were positive for sepsis and showed growth on culture plate of which 13(22.4%) were positive for pseudomonas, 19 (32.7%) were positive for Klebsiella and 26 (45%) were positive for other organisms mainly staphylococcus and proteus (Figure 1).

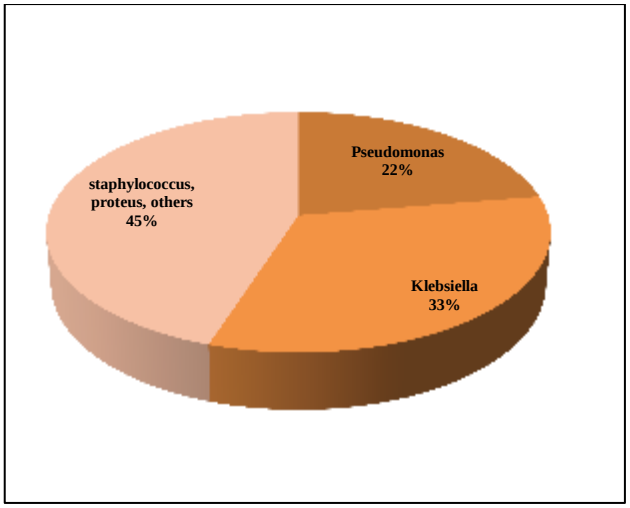

Figure 1: Blood culture growth analysis.

Table 1 showed the antibiotic sensitivity for 19 cases of klebsiella of which Meropenem 18 (94.7%) and Imipenem 12 (63.15%) were highly sensitive for klebsiella.

Table 1: Antibiotic sensitivity for Klebsiella (n = 19).

Antibiotics	Sensitivity	Percentage %
Piperacillin + TZ	10	52.6
Carbencillin	8	42.3
Amoxicillin	4	21.1
Ceftazidime	8	42.3
Imipenem	12	63.1
Cefotaxim	6	31.5
Meropenem	18	94.7
Amikacin	9	47.3
Ciprofloxacin	11	57.8
Augmentin	7	36.8

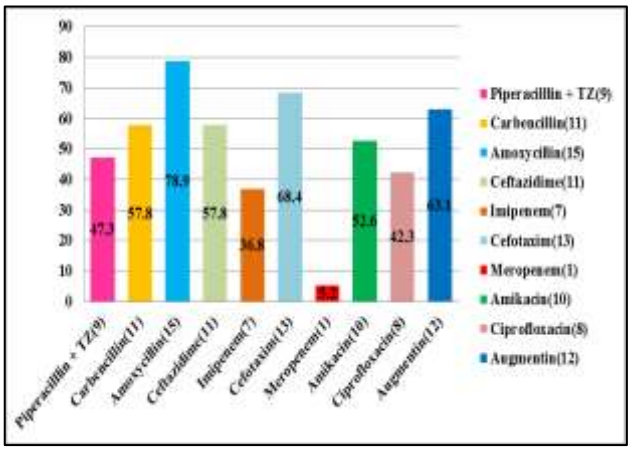

Figure 2: Antibiotic resistance for Klebsiella (n = 19).

In Figure 2, among 19 Klebsiella cases, highest resistance was seen with Amoxicillin 15 (79.8%) followed by Cefotaxim 13 (68.4%).

Table 2: Antibiotic sensitivity for pseudomonas (n = 13).

Antibiotics	Sensitivity	Percentage %
Piperacillin + TZ	11	84.6
Carbencillin	9	69.2
Amoxicillin	2	15.3
Ceftazidime	11	84.6
Imipenem	9	69.2
Cefotaxim	10	76.9
Meropenem	13	100
Amikacin	9	69.2
Ciprofloxacin	8	61.5
Augmentin	3	23.1

Table 2 showed the antibiotic sensitivity for 13 case of pseudomonas of which Meropenem 13 (100%), Piperacillin+TZ and Ceftazidime both 11 (84.6%) were highly sensitive for pseudomonas.

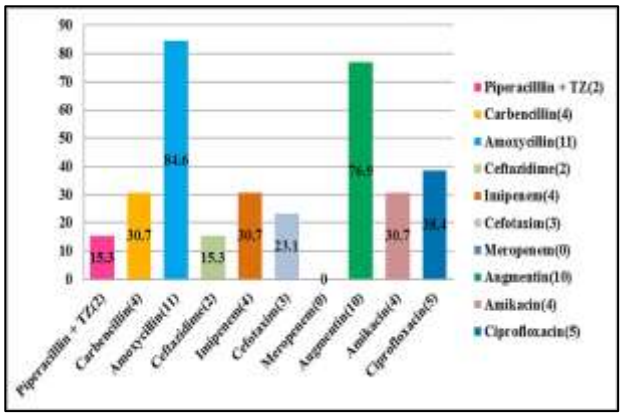

Figure 3: Antibiotic resistance for pseudomonas (n = 13).

Figure 3 depicted that among 13 cases for pseudomonas, Amoxicillin 11 (84.6%) showed highest resistance followed by Augmentin 10 (76.9).

DISCUSSION

Neonatal septicemia being one of the life threatening conditions needs rapid treatment with essential antibiotics, for the effective management of neonatal septicemia cases, study of the bacteriological profile with their antibiotic pattern plays a significant role.[9]

In our study 58 (77.33%) cultures were positive for sepsis while in Sharma CM et al study culture positivity rate was 37.63%, in Shah AJ et al study was 31.75%, Shaw CK et al study was 54.64%, Bhattacharjee et al study was 32%.[10-13]

The results antibiotic sensitivity and resistance pattern revealed that 13 (22.4%) were positive for pseudomonas, 19 (32.7%) positive for Klebsiella, both pseudomonas and Klebsiella were resistant to Amoxicillin while Meropenem, Piperacillin+TZ, Imipenem and Ceftazidime proved to be the effective antibiotics. These results were evident with similar study conducted by Desai KJ et al.[14]

In our study Klebsiella was the commonest gram negative organism isolated. This finding is consistent with the studies carried out by Dr. Kairavi et al, Anwer SK et al, Mahmood A et al and Preeti MH et al where Klebsiella was the most commonly isolated gram negative micro-organism.[15-18] While study by Movahedian AH et al revealed pseudomonas (36%) was the most common isolated followed by coagulase oxidase negative staphylococcus (CoNS) (20.7%) and Klebsiella pneumonia.[19]

In comparison to study by Maimoona Mustafa et al which showed that Pseudomonas was 100% sensitive to Imipenem, colistine, 50% sensitive to Amikacin, Ciprofloxacin 25% sensitive to Gentamycin, our study revealed 100% sensitivity of pseudomonas to Meropenem, Piperacillin+TZ and Ceftazidime both 84.6% sensitivity, 69.2% sensitivity to Amikacin and Imipenem, while 61.5 % sensitivity towards Ciprofloxacin.[20]

In present study, gram-negative isolates were frequently found to be resistant to amoxicillin hence they must be judiciously used to minimize the morbidity and mortality and also to reduce the emergence of multidrug resistant organisms in NICU. For empiric management of infection there is a need for continuous surveillance pattern and effective hospital infection control. Bacterial strains resistant to most classes of antibiotics will continue to emerge unless inappropriate uses of drugs are curtailed and continuous education of infection control practice maintained.

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