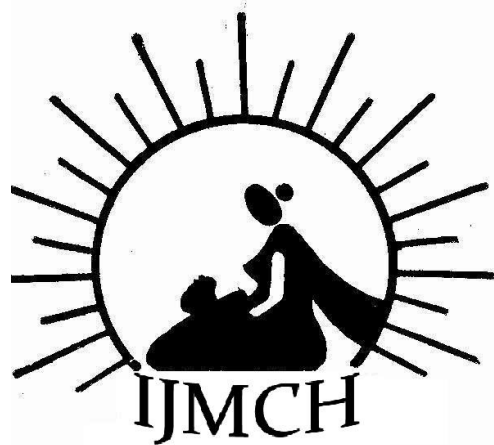


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**Bacterial isolates and their antibiotic
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Epidemiology and surveillance of neonatal sepsis helps in implementation of rational empirical antibiotic strategy.

Bacterial isolates and their antibiotic susceptibility patterns in Neonatal sepsis

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Abstract

Background: Epidemiology and surveillance of neonatal sepsis helps in implementation of rational empirical antibiotic strategy.

Objective: To study the frequency of bacterial isolates of neonatal sepsis and their sensitivity pattern in neonates treated in NICU, Tertiary Hospital, Kempegowda Institute of Medical Sciences, Bangalore.

Methods: In this retrospective study, the neonates, in whom neonatal sepsis was suspected and blood culture done were selected. Their bacterial isolate identification and antibiotic susceptibility done by standard microbiological method was studied. The demographic data, blood culture reports, organisms and their antibiotic susceptibility and resistance pattern were obtained from the unit register and/or neonatal case records. data analyzed.

Results: Out of 918 neonates screened, there were 180(19.2%) positive blood cultures. After excluding coagulase-negative Staphylococci and candida, we identified 108 Neonatal sepsis cases with bacterial growth. The incidence of Gram positive and gram negative organisms represented causative 52.7% and 47.3% respectively of culture isolates. Gram positive organism Staphylococcus aureus remained the predominate isolate, followed by gram negative isolates Klebsiella and others. Gram positive group had greater susceptibility to higher antibiotics vancomycin, linezolid, cephalosporin, quinolones in order and low susceptibility to ampicillin. In Gram negative group best susceptibility was to amikacin, gentamycin, linezolid, quinolones, cephalosporins in order. The susceptibility was remarkably low to ampicillin.

Conclusion: The incidence of neonatal septicemia is high and reflects the high magnitude of problem. Organisms isolated in the study exhibited higher resistance towards commonly used antimicrobials. The periodic survey of etiological agents and their antibiotic susceptibility pattern is indeed necessary for timely alarm of such type of problems and help in implementation of rational empirical treatment strategy.

Keywords: Neonatal sepsis, bacterial isolates, antibiotic susceptibility.

Introduction

Neonatal septicemia refers to generalized bacterial infection documented by positive blood culture in first four weeks of life .It is the major cause of mortality and morbidity accounting for 30-50% neonatal deaths in developing countries[1].In India a lot of neonatal mortality is accountable by septicemia and its treatment failure due to emergence of drug resistance. The fact is that the isolated organisms have developed increased drug resistance over the last few years[2,3].Neonatal Improvement in outcome and successful treatment depends on early initiation of appropriate antibiotic therapy. This highlights the need for surveillance of sepsis for optimum therapy. Knowledge of likely causative organisms and their antimicrobial sensitivity pattern could aid in choosing prompt and appropriate therapy for neonatal sepsis. Current study was undertaken to find out the common bacterial pathogens and their susceptibility pattern in neonates with sepsis in a tertiary care hospital providing neonatal intensive care services.

Methods

Present study was carried out in a neonatal unit of Tertiary care centre and teaching hospital, Kempegowda institute of Medical sciences ,Bangalore from September 2012 to August 2014. We retrospectively evaluated the case records of neonates ,who admitted in NICU with suspected neonatal sepsis. Selection was based on the signs and symptoms of fever, refusal to feeding ,respiratory distress , cyanosis ,cold clammy skin, tachycardia , seizures, hyperreflexia, jaundice,instability etc. Volume of 1-2 ml blood was drawn aseptically before starting antimicrobial treatment and inoculated directly into brain heart infusion in ratio of blood:BHI of 1:10.the processing of collected blood samples for culture and isolation was done by standard microbiological method[4]. Bacterial isolates were identified and antimicrobial susceptibility test was performed using Kirby Bauer disc diffusion method. The demographic data, blood culture reports, organisms and their antibiotic susceptibility were obtained from the unit register and/or neonatal case records. Neonates with blood cultures that grew only coagulase-negative staphylococcus were excluded as most of the time it is contaminated and single sample inconclusive[5]. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 11.5 software.

Results

Of 918 neonates screened for neonatal sepsis, there were 180 (19.6%) positive blood cultures. After excluding growth of coagulase-negative Staphylococci (67 cases)candida(5), we identified 108 cases of neonatal sepsis with bacterial growth . Out of 918 neonates were shown in Table 1. The male (519) to female (399) ratio was 1.3:1.

Table 1: Gender distribution of patients studied

Gender	No. of children	%
Male	519	56.53
Female	399	43.47
Total	918	100.0

Table 2: Preterm/Term

Preterm/Term	No. of children	%
Preterm	354	38.56
Term	564	61.44
Total	918	100.0

Table 3: Frequency of isolates

Blood culture growth	No. of children (n=918)	%
No growth	738	
Growth	180	19.6
• CONS	67	7.29
• Staph aureus	57	6.20
• Kleibsella	14	1.50
• Enterococcus	12	1.30
• Pseudomonas	8	0.87
• E .coli	4	0.43
• Acinetobacter	5	0.54
• Enterobacter	7	0.76
• NFGNB	1	0.10
• Candida	5	0.54

Table 4: Bacterial growth

Bacterial growth	No. of children (n=108)	%
Growth	108	100.0
• Staph aureus	57	52.7
• Klebsiella	14	12.9
• Enterococcus	12	11.1
• Pseudomonas	8	7.4
• Enterobacter	7	6.4
• Acinetobacter	5	4.6
• E.Coli	4	3.7
• NFGNB	1	0.9

Table 5: Susceptibility % of gram positive (Staph aureus) and gram negative (remaining)

Antimicrobials: Sensitivity pattern	Gram Negative (n=51)	Gram Positive (n=57)
Amoxyclav/ Ampicillin	6(11.7%)	18(31.56%)
Gentamycin	42(82.3%)	44(77.1%)
Amikacin	44(86.2%)	0(0%)
Cotrimoxizole	18(35.39%)	26(45.5%)
Tobramycin	14(27.4%)	12(21.1%)
Ciprofloxacin	32(62.3%)	36(70.1%)
Vancomycin	15(26.8%)	55(97%)
Clindamycin	19(37.5%)	48(84.2%)
Linazolid	38(74.5%)	52(91.2%)
Tetracycline	17(33.3%)	30(52.6%)
Erythromycin	7(13.8%)	29(50.8%)
Cefoperozine	22(52.1%)	48(84.2%)
Cefipime	32(62.7%)	42(73.7%)
Imepenem	30(58.5%)	12(21.1%)
Cefuroxime	8(15.6%)	20(35.1%)

Cloxacillin	16(31.3%)	32(56.1%)
Pipercillin	28(54.9%)	39(68.4%)

Table 6: Resistance % of gram positive (Staph aureus) and gram negative (remaining)

Antimicrobials: Resistance pattern	Gram Negative (n=51)	Gram Positive (n=57)
Amoxyclav/ Ampicillin	42(82.3%)	28(49.1%)
Gentamycin	15(29.4%)	3(5.2%)
Amikacin	7(15.68%)	3(5.2%)
Cotrimoxizole	15(36.6%)	19(33.3%)
Tobramycin	3(5.8%)	2(3.5%)
Ciprofloxacin	16(31.3%)	12(21.2%)
Vancomycin	0(0%)	0(0%)
Clindamycin	5(9.8%)	7(12.1%)
Linazolid	3(5.8%)	2(3.5%)
Tetracycline	14(27.4%)	16(28.0%)
Erythromycin	14(27.4%)	26(45.6%)
Cefoperozine	21(51.2%)	5(15.2%)
Cefipime	16(31.3%)	12(21.05%)
Imepenem	6(11.76%)	0(0%)
Cefuroxime	39.2(48.8%)	10.5(0%)
Cloxacillin	8(15.6%)	10(17.5%)
Pipercillin	3(5.9%)	0(0%)

Discussion

Neonatal septicemia remains a major clinical problem in neonatology with high morbidity and mortality rate, especially, the amplitude of problem is higher in developing countries like India. In the present study the blood samples received from the neonates comprised approximately one fifth of the total samples for culture and sensitivity and the rate of positivity was 19.6% which reflects the high magnitude of problem. This finding is very close to that of Agnihotri et al (19.2%) Arora et al (20.02%) and Shreshtha et al (20%) from Nepal and India (6,7,8). Administration of prior antibiotics, infection with anaerobes or effective

control in spread of noscomial infection,might be the reason for variable results in different studies .We used conventional blood culture techniques in the present study. We excluded CONS from analysis because we used single blood sample for culture and it was difficult to analyse the response to antibiotics from the retrospective nature of the study[5].A male predominance was found in our study which agrees with previous reports . Bacteria causing neonatal sepsis continue to change . They also differ from developed to developing country and place to place.

In the present study gram positive bacilli predominate over gram negative organisms , staph aureus was the most frequent isolate followed by Kleibsella , which is in agreement with the studies done by Arora et al, shreshtha et al and karthikeyan (8,9,10) staphylococci, is the most common hospital acquired organism which accounts for most of the infections. Similarly its greater prevalence in neonatal septicemia could be explained by the fact, that there is high chance of this transmission to neonates from health workers and relatives(11). Kleibsella and enterobacter spp have been reported as the leading gram negative organisms by the various studies. (8,9) Similarly the present study also revealed kleibsella spp as the most common among gram negative isolate followed by Enterococcus, Pseudomonas, Enterobacter , acinetobacter and E.coli.

In Gram positive group had greater susceptibility to vancomycin (97%), linezolid (91.2%),clindamycin(84.2%), ciprofloxacin(70.1%) and to aminoglycosides, low susceptibility to ampicillin (31.5%). In Gram negative group, best susceptibility was to Amikacin (86.2%),followed by other aminoglycosides ,linezolid (74.5%), Imipenem (58.5%) cefepime(62.7%)ciprofloxacin (62.3%). The susceptibility was remarkably low to ampicillin(11.7%).

As neonatal septicemia is considered as life threatening emergency condition,prompt treatment with antibiotics is necessary.W H O has recommended the use of pencillin or ampicillin plus an aminoglycoside for neonates.With the advent of third generation cephalosporin,the empirical use of antimicrobial approach for the neonatal septicemia has changed in many centres.The appropriate combination of these drugs is being followed in our tertiary hospital. In the present study around 82% of gram negative isolates showed resistance to ampicillin.

The low resistance exhibited by most isolates in the study against the antimicrobials like aminoglycosides ,quinolones and other higher antibiotics like vancomycin ,linezolid ,piperacillin,imepenem may attributed to the less use of these antibiotics in clinical setting for neonates .

Antibiotic resistance in the present study was quiet high resistance to recommended drugs like,ampicillin,cephalosporins, awares to seek for alternative antimicrobial agents .As the present study shows vancomycin or piperacillin to be less resistant drug as compared to other antimicrobials in staphylococcus aureus and aminoglycosides in gram negative organisms, use of vancomycin or piperacillin along with aminoglycosides can be recommended as alternative in neonatal sepsis. To prevent the logarithmic growth of this problem,we should stress upon more preventive measures, so that we prevent neonatal sepsis. similarly the periodic survey of etiological agents and their susceptibility pattern should be done as the patterns of bacterial organisms are changing constantly with time and place and than the uncertainty regarding choice of antibiotics can be minimized.

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