

## **Bacterial isolates and their Antibiotic susceptibility patterns in Neonatal sepsis.**

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### **Abstract**

Epidemiology and surveillance of neonatal sepsis helps in implementation of rational empirical antibiotic strategy. The present study was conducted to record the frequency of bacterial isolates of neonatal sepsis and their sensitivity pattern in neonates treated in our tertiary care NICU. In this retrospective study, neonates in whom neonatal sepsis was suspected and blood culture done were included. Their bacterial Isolate identification and antibiotic susceptibility 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 was tabulated and analysed. Out of 918 neonates screened, there were 180(19.2%) positive blood cultures. After excluding CONS, Gram positive organism *Staphylococcus aureus* (52.7%) remained the predominate isolate, followed by gram negative isolates (47.3%) *Klebsiella* and others. Gram positive group had greater susceptibility to higher antibiotics like; 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 that order. The susceptibility was remarkably low to ampicillin. 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.

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### **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]. 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 feed, 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 (Table.1). After excluding growth of coagulase-negative Staphylococci (67 cases) and candida (5), we identified 108 cases of neonatal sepsis with bacterial growth. Out of 918 neonates, the male (519) to female (399) ratio was 1.3:1 and 564 term neonates and 354 preterm neonates included.

The incidence of Gram positive and gram negative organisms represented 52.7% and 47.3% respectively of culture isolates. Gram positive organism Staphylococcus aureus [52.7%] remained the predominate isolate, followed by gram negative isolates Klebsiella [12.9%], Enterococcus [11.1%], Pseudomonas [7.4%], Enterobacter [6.4%] and others.

Gram positive group had greater susceptibility to higher antibiotics vancomycin [97%] linezolid [91.2%], cephalosporin [84%], quinolones [70.1%] in order and low susceptibility to ampicillin [31.5%]. In Gram negative group best susceptibility was amikacin [86.2%], gentamycin

[83.2%], linezolid [74.5%], quinolones [62.3%], cephalosporins [62%] in order. The susceptibility was remarkably low to ampicillin [11.7%] as shown in Table 2.

The gram positive organisms had greater resistance to Ampicillin and least resistance to Vancomycin, Linezolid, Piperacillin, Clindomycin and others. The gram negative organisms had greater resistance to Ampicillin, cephalosporins and least to Vancomycin, linezolid, Piperacillin, Clindomycin, Amikacin, Gentamycin (Table 2).

**Table 1.** Frequency of isolates

Blood culture done	No of Neonates (918)	
No growth	738	
Positive culture	180	
CONS	67	
Bacterial growth (excluding CONS)	108	100%
Staph aureus	57	52.7
Klebsiella	14	12.9
Enterococcus	12	11.1
Pseudomonas	8	7.4
E .coli	7	6.4
Acinetobacter	5	4.6
Enterobacter	4	3.7
NFGNB	1	0.9

**Table 2.** Susceptibility and resistance of gram positive and gram negative bacteria.

Antimicrobials	Gram Positive sensitivity	Gram Positive resistance	Gram Negative sensitivity	Gram Negative Resistance
Ampicillin	18(31.56%)	28(49.1%)	6(11.7%)	42(82.3%)
Gentamycin	44(77.1%)	3(5.2%)	42(82.3%)	15(29.4%)
Amikacin	12(21.1%)	3(5.2%)	44(86.2%)	7(15.68%)
Cotrimoxizole	26(45.5%)	19(33.3%)	18(35.39%)	15(36.6%)
Tobramycin	12(21.1%)	2(3.5%)	14(27.4%)	3(5.8%)
Ciprofloxacin	36(70.1%)	12(21.2%)	32(62.3%)	16(31.3%)
Vancomycin	55(97%)	0(0%)	15(26.8%)	0(0%)
Clindamycin	48(84.2%)	7(12.1%)	19(37.5%)	5(9.8%)
Linezolid	52(91.2%)	2(3.5%)	38(74.5%)	3(5.8%)
Tetracycline	30(52.6%)	16(28.0%)	17(33.3%)	14(27.4%)
Erythromycin	29(50.8%)	26(45.6%)	7(13.8%)	14(27.4%)
Cefoperozine	48(84.2%)	5(15.2%)	22(52.1%)	21(51.2%)
Cefipime	42(73.7%)	12(21.05%)	32(62.7%)	16(31.3%)
Imepenem	12(21.1%)	0(0%)	30(58.5%)	6(11.76%)
Cefuroxime	20(35.1%)	10.5(0%)	8(15.6%)	39.2(48.8%)
Cloxacillin	32(56.1%)	10(17.5%)	16(31.3%)	8(15.6%)
Piperacillin	39(68.4%)	0(0%)	28(54.9%)	3(5.9%)

## Discussion

Neonatal septicemia remains a major clinical problem with high morbidity and mortality rate, especially 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 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 [6-8]. 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 is in agreement 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 [8-10]. Staphylococci 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 its 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.

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, the best susceptibility was to amikacin (86.2%), gentamycin (82.3%), linezolid (74.5%) cefipime (62.7%), ciprofloxacin (62.3%). The susceptibility was remarkably low to ampicillin (11.7%) and the resistance was least to vancomycin, piperacillin, clindamycin, inezolid and amikacin in both groups.

As neonatal septicemia is considered a life threatening emergency condition, prompt treatment with antibiotics is necessary. WHO has recommended the use of pencyllin 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. 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, may be attributed to the less use of these antibiotics in clinical setting for neonates .

Antibiotic resistance in the present study was quiet high against to commonly used drugs like, ampicillin, cephalosporins. As the present study shows vancomycin or piperacillin to be less resistant drugs compared to other antimicrobials in staphylococcus aureus and aminoglycosides in gram negative organisms, use of vancomycin or piperacillin along with aminoglycosides can be recommended for 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 surveillance of etiological agents and their susceptibility pattern should be done as the patterns of bacterial organisms are changing constantly with time and place in order to use better choice of antibiotics.

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