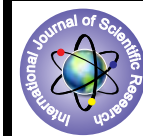


An Antibiotic Susceptibility Pattern of Various isolates of Neonatal Septicaemia - Study in tertiary care hospital, Rajkot



Medical Science

KEYWORDS : Septicemia, Antibiotic susceptibility, Drug resistance, neonates

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ABSTRACT

Background: Neonatal septicemia is a major cause of Neonatal morbidity & mortality in developing country more commonly due to improper aseptic condition during delivery and postnatal follow up. As in this new era due to use of broad spectrum availability of newer and more potent antibiotics, resistant strain became a major problem in NICU. It might be possible to reduce these deaths by early diagnosis and proper management. **Objectives:** To know the antibiotic susceptibility pattern of various isolates. **Methods:** A hospital based prospective study was carried out in 100 clinically suspected cases of neonatal septicaemia in New Born Intensive Care Unit (NICU) at P.D.U Medical College & Hospital Rajkot. **Results:** Out of 100 neonates with clinically suspected neonatal septicemia, 62(62%) were blood culture positive. Gram negative bacteria accounted for 50(80.65%) & Gram positive bacteria accounted for 12(19.35%) of all cases. The antibiotic sensitivity of Gram negative isolates in screening test suggested 100% Extended Spectrum Beta Lactamases (ESBLs) producers. Gram Positive Bacteria like staph.aureus is 100% sensitive to linezolid, 75% sensitive to vancomycin, whereas CONS and enterococci shows were sensitive to 100% sensitive to linezolid, vancomycin, Rifampicin. Methicillin resistance was seen in 75% of Staphylococcus aureus and 66.66% of Coagulase negative staphylococcus. Gram Positive cocci were all sensitive to Vancomycin. **Conclusion:** Organisms isolated from neonatal septicaemia are multidrug resistant. Continued surveillance for various isolates and their susceptibility tests should be done effectively and timely to treat the patients of neonatal septicaemia. This study will guide the physician to formulate antibiotic strategy which prevent the mortality & morbidity as well emergence of resistant organisms.

Introduction: Neonatal sepsis is the term used for systemic inflammatory response to infection in first month of life. It is manifested by nonspecific signs and symptoms. It is caused by invasion of micro-organisms, their active multiplication in blood and release of toxic substances. It is diagnosed by a positive blood culture during the first month of life^{1,2}.

Neonatal mortality rate in India is 44 per 1000 live birth, which accounts for nearly 2/3rd of Infant mortality rate. Prematurity, Low birth weight, Birth asphyxia & neonatal septicemia are most common causes of neonatal mortality and morbidity. Out of all these, neonatal septicemia is the major hurdle in achieving our goals³.

The detection of microorganisms in a patient's blood is very important to know the nature of organisms & the antibiotic susceptibility. For that, blood culture always remains the gold standard method for laboratory diagnosis. In utero, the environment is sterile and the immune system of the fetus is solely dependent upon his or her mother's immune system. So the newborn is prone to get infected. Such infections usually spread rapidly and if not recognized and treated promptly, may be fatal⁴.

A part from this, there is always a changing pattern of causative organisms so there is a threat of emergence of fulminant sepsis. So with the help of blood culture we can reach to early diagnosis & treatment & also reduce the indiscriminate use of antibiotics. This will all result in decreasing the neonatal mortality.

Irrational use of various broad spectrum antibiotic leads to emergence of multi drug resistant strains which became a major problem in NICU. As there is changing pattern of etiological agent antibiotic susceptibility test will guide proper treatment.

Due to constantly changing antimicrobial resistant patterns, it is necessary to do antimicrobial sensitivity surveillance. This will help physician to provide safe and effective treatment, as well as help to make antibiotic policy⁵

Determination of antibiotic sensitivity patterns in periodic intervals is necessary for appropriate treatment & for prevention of emergence of multi drug resistant organism.

Therefore, present study is undertaken to know the antibiotic susceptibility of common organism of neonatal septicemia admitted in a tertiary care hospital in Rajkot.

Material and Methods: This study was carried out in P.D.U Medical College and Hospital, Rajkot from a period of July 2009 to June 2010. Blood Samples were collected from 100 clinically suspected cases of neonatal septicemia, admitted in New Born Intensive Care Unit (NICU) at P.D.U Medical College & Hospital Rajkot. The sample was collected from all neonates less than 4 weeks who presented with clinical history suggestive of neonatal septicemia were included in this study. Blood samples were collected by aseptic vein puncture and inoculated into a blood culture bottle containing 20 ml of Brain Heart Infusion broth. After inoculation, the blood culture bottles were incubated at 37°C under aerobic conditions in the incubator for 7 days. The first subculture was done after 24 hours of incubation, the second on third day & final on the seventh day. Subcultures were done onto, 5% sheep blood agar and McConkey agar plates. The inoculated plates were incubated aerobically in the Incubator at 37°C for 24 hours and the plates were observed for growth. The growth was identified by colony characteristics, gram's stain and standard biochemical tests described in Mackie & McCarty, Practical Medical Microbiology⁶ & Bailey and Scott's Diagnostic Microbiology⁷ & Koneman⁸. After the isolation of bacteria, antibiotic sensitivity testing was done by Kirby-Bauer disc diffusion method on MullerHinton (MH) agar as per CLSI recommendations⁹.

Result: In our study out of 100 cases of neonatal septicemia, blood culture were positive in 62(62%) & negative in 38(38%). Out of 62 cases 50(80.65%) were Gram negative organisms & 12(19.35%) were Gram Positive organisms.

Gram negative organisms, most common organism was Klebsiella spp. 25 (40.32%) followed by of E.coli, 8 (12.90%) & Ac-

netobacter spp.8(12.90%), pseudomonas(6.45%),enterobacter(6.45%),proteus (1.61%). Whereas the most common Gram

positive organisms was Stap.aureus 8 (12.90%) followed by of CONS 3(4.84%), enterococci (1.61%).

Table no.1
Antibiotic sensitivity pattern of the the Enterobacteriaceae.

Organisms	Antibiotic used									
		Piperacillin/Tazobactam	Ceftazidime	Piperacillin	Amikacin	Gentamicin	Cefotaxime	Imipenem	Cotrimoxazole	Amoxicillin + Clavulanic acid
<i>E.coli</i> (8)	No	3	2	3	2	4	1	8	3	1
	%	37.5	25	25	12.5	50	12.5	100	37.5	12.5
<i>Klebsiella spp</i> (25).	No	1	1	1	1	0	1	25	1	0
	%	4	4	4	4	0	4	100	4	0
<i>Proteus spp</i> (1)	No	0	0	0	0	0	0	1	1	0
	%	0	0	0	0	0	0	100	4	0
<i>Enterobacter</i> (4)	No	1	0	1	0	2	0	4	0	0
	%	25	0	0	25	50	0	100	0	0

Most of the Gram-negative organisms were resistant to commonly used antibiotics. Isolated enterobacteriaceae showed

maximum resistant for 3rd generation cephalosporins followed by cotrimoxazole, aminoglycosides they are 100% sensitive to carbapenem group.

Table no .2
Antibiotic sensitivity pattern of the Acinetobacter spp. & Pseudomonas spp.

Organisms	Antibiotic used										
		Ceftazidime	Amikacin	Gentamicin	Aztreonam	Cotrimoxazole	Imipenem	Meropenam	Piperacillin/Tazobactam	Amoxi/ clavulanic acid	Piperacillin
<i>Acinetobacter spp</i> (8)	No	3	2	1	-----	3	8	8	4	0	2
	%	37.5	25	12.5	-----	37.5	100	100	50	0	25
<i>Pseudomonas spp.</i> (4)	No	1	0	0	2	-----	4	4	3	-----	3
	%	25	0	0	40	-----	100	100	75	-----	75

Isolated acinetobacter spp were 100% sensitive to imipenem & meropenem as well as piperacillin/tazobactam.

Isolated Paeruginosa showed less resistance than other isolated Gram negative bacilli. Of them 25% were resistant to ceftazidime and 40 to aztreonam and 100% sensitive to imipenem.

Table no 3
Antibiotics sensitivity of Gram Positive Bacteria

Organism	Antibiotic used								
		Penicillin	Clindamycin	Oxacillin	Erythromycin	Linezolid	Vancomycin	Rifampicin	Gentamicin
<i>Enterococcus</i> (1)	No	0	-----	-----	-----	1	1	1	0
	%	0	-----	-----	-----	100	100	100	0
<i>Staphylococcus aureus</i> (8)	No	0	2	2	2	8	6	3	1
	%	0	25	25	25	100	75	37.5	12.5
CONS(3)	No	1	3	1	2	3	3	3	0
	%	33.33	100	33.33	66.66	100	100	100	0

Note: ----- indicate antibiotics not used.

Gram positive organism showed maximum resistance to penicillin, erythromycin, aminoglycoside. Methicillin resistance was found in 75% *Staphylococcus aureus*. Isolated all *Enterococci* were sensitive vancomycin, linezolid but it is resistant to gentamicin.

Discussion: Antibiotic sensitivity pattern of micro - organisms is always changing. Bhakoo et al135 had observed gentamicin sensitivity in 80% cases of *Klebsiella sepsis* but today it is of

no use due to development of resistance to gentamicin. In past, penicillin was effective for gram positive organisms. Now a days they are usually not effective for such micro organisms.

Shaw CK et al137 study shows that imipenem is 100% sensitive to *Klebsiella spp*, *Pseudomonas spp*, *Acinetobacter spp*, *E.coli*, *Enterobacter spp* which is compared with present study.

Neelam Kaistha et al125 Maximum resistance among Gram-negative organisms was seen in amoxicillin/ampicillin and third-generation cephalosporins. Amikacin, cefoperazone/sulbactam

and imipenem were found to be good alternative drugs. Among Gram-positive organisms, all strains were sensitive to Vancomycin.

El-Jadba AHE et al 138 the most effective antibiotic for Gram negative isolates was meropenem, while the most effective antibiotic for Gram positive isolates was vancomycin.

In present study Gram Positive bacteria are sensitive to vancomycin, clindamycin, linezolid, rifampicin, whereas resistant to penicillin, gentamicin and erythromycin are noted among them.

In present study Gram Negative bacteria are sensitive to imipenem, meropenem, whereas resistant to aminoglycoside, quinolone, cephalosporins are noted among them. In our study *Klebsiella* was the most common organism in both early onset sepsis. After *Klebsiella*, the most common organisms were *Acinetobacter* & *Staphylococcus aureus* in however in contrast with our study the Movahedian AH found that gram-positive organisms constituted the majority of early onset sepsis. This result could be because of predominance of Group B *Streptococcus* (GBS) in developed countries.

Conclusion: As there is changing pattern of bacterial isolates for neonatal septicemia, like first gram positive organism are responsible for most of the cases now a days gram negative organisms replacing gram positive organisms. Along with gram negative organism their antibiotic susceptibility pattern also changed as there is emergence of multi-drug resistant organism. As in our study most of the gram negative organisms are ESBL producer & most of the gram positive organisms are MRSA. Now a day among gram positive organisms VISA, VRSA, as well as resistance against high level gentamicin, VRE & macrolide resistant are more common. Therefore great caution is required in selection of antibiotic therapy. This indicates the variable nature of antibiotic susceptibility patterns both in time and location therefore; it is advisable to continuously evaluate the sensitivity-resistance pattern of isolates so as to make a rational use of antibiotics. So, determination of antibiotic sensitivity patterns in periodic intervals is necessary in each region for choosing appropriate antibiotic therapy. In the view of above, the strategy of antibiotic usage in the hospital must be reviewed.

So, prompt use of antibiotics according to standard antibiotic policy is warranted to save newborns from septicemia.

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