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ORIGINAL ARTICLE

BACTERIOLOGICAL PROFILE AND ANTIBIOGRAM OF NEONATAL SEPTICEMIA

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ABSTRACT

Background: Early diagnosis and proper management of neonatal septicemia can bring down the morbidity and mortality substantially.[4] Hence the aim of this study was to study the bacteriological profile of neonatal septicemia cases and their antibiogram for planning strategy for the management of these cases.

Methodology: A retrospective study of bacterial isolates from cases of neonatal septicemia was undertaken over a period of 13 months from January 2006 to February 2007 at B.J.Medical College, Civil Hospital, Ahmedabad, Gujarat.

Result: Blood culture was positive in 55.6% of cases. Gram negative septicemia was encountered in 63% and it was predominant septicemia compared to gram positive septicemia. *Klebsiella* species (59.10%) and *Escherichia coli* (31.99%) were the predominant pathogens followed by *Pseudomonas, Acinetobacter* and *Citrobacter* species. The most effective antimicrobials against *Klebsiella* species and *Escherichia coli* were Carbapenems followed by Piperacillin + Tazobactam, 2nd generation Quinolones and Amoxicillin + Clavulonic acid. Where as in case of *Pseudomonas* 2nd generation Quinolones were most effective followed by Carbapenems, Aminoglycosides, Piperacillin + Tazobactam, Ceftazidime and Aztreonam. Out of 187 gram positive isolates, 171 (91.4%) were coagulase negative staphylococci, 8 (4.3%) were staphylococcus aureus, and 8 (4.3%) were streptococci. Gram positive isolates were more sensitive to Vancomycin followed by Linezolid, Clindamycin and higher Quinolones.

Conclusion: Neonatal septicemia is a life-threatening emergency, and rapid treatment with antibiotics is essential for favourable outcome. For effective management of neonatal septicemia cases, strategy of antibiotic usage in the hospital must be reviewed

KEYWORDS: neonatal septicemia, bacteriological profile, antibiogram, resistance

INTRODUCTION

Septicemia in neonates refers to the presence of microbes or their toxins in blood.[1] It is documented by positive blood culture in the first four weeks of life and is one of the leading causes of neonatal mortality in India.[2] Prior to the antibiotic era, the mortality from septicemia was 90%. But with presently available antimicrobial agents, it may be treated successfully and mortality from septicemia in neonates has declined to 24.58%.[3, 4]

However, with presently available antimicrobial agents, neonatal septicemia may be treated successfully. Early diagnosis and proper management of neonatal septicemia can bring down the morbidity and mortality substantially.[4] Hence the aim of this study was to study the bacteriological profile of neonatal septicemia cases and their antibiogram for planning strategy for the management of these cases.

MATERIALS AND METHODS

The study was conducted in the Microbiology Department at B.J.Medical College, Ahmedabad, India. This is a tertiary care centre with more than 2200 bedded hospital. This is a retrospective study.

Table 1: Antibiotics used with their concentrations and codes

Antibiotic	Code	Concentration
Gram negative bacilli		
Ampicillin+Sulbactam	AMC	20μg
Cefuroxime	CXA	30 μg
Ceftriaxone	CRO	30 μg
Cefoperazone+ Sulbactam	CSL	105 μg
Ciprofloxacin	CIP	5 μg
Levofloxacin	LVX	5 μg
Meropenem	MEM	10 μg
Gentamycin	GEM	10 μg
Amikacin	AMK	30 μg
Tetracycline	TCY	30 μg
Chloramphenicol	CHL	30 μg
Cotrimoxazole	SXT	25 μg
Piperacillin+Tazobactam	TZP	110 μg
Cefotaxime	CTX	30 μg
Ceftazidime	CAZ	30 μg
Aztreonam	ATM	30 μg
Gram positive species		
Azithromycin	AZM	15 μg
Linezolid	LNZ	30 μg
Vancomycin	VAN	30 μg
Oxacillin	CLO	1μg
Ciprofloxacin	CIP	5 μg
Levofloxacin	LVX	5 μg
Clindamycin	CLI	2 μg
Gentamycin	GEM	10 μg
Penicillin G	PEN	10 U
Tetracycline	TCY	30 μg
Chloramphenicol	CHL	30 μg
Cotrimoxazole	SXT	25 μg

All data is collected from the samples received in our department. (So, Ethical committee permission is not required). Blood from 900 neonates admitted in NICU with clinical suspicion of septicemia was collected for culture and sensitivity, during the period of January 2006 to February 2007.

The processing of blood samples for culture and isolate identification was done by standard methods.[5] The antibiotic susceptibility was determined by the stokes disk diffusion method as per NCCLS recommendations.[6]

RESULT AND DISCUSSION

Table 1 shows the names and concentrations (in μg) of various antibiotics used. The plates were incubated at 37°C and reading was taken after overnight incubation.

Table 2 shows rates of isolates in percentage (%).

Table 2: Percentage of various isolates from 500 positive samples

Organism	No. of isolates	%
Klebsiella species	185	37 %
E.coli	100	20 %
Pseudomonas spp.	20	4 %
Acinetobacter spp.	6	1.2 %
Citrobacter spp.	2	0.4 %
Coagulase negative staphylococci	171	34.2 %
Staphylococcus aureus	8	1.6%
Streptococci	8	1.6%
Total	500	100%

Table 3a shows Antibiotics sensitivity results of the gram negative isolates in percentage (%).

In this study blood culture positivity rate in neonatal septicemia cases was 56.67% whereas in 43.33% of cases there was no growth. A study done by Sharma *et al* also reported positivity rate 56 % which was well correlated with our study. [7] Gram-negative isolates constituted major group (62.48 %), than Gram positive isolates (37.33%), which is comparable with the study of Nalini *et al* (58.5 % and 48.5% respectively).[2]

Table 3b shows Antibiotic sensitivity of Gram positive isolates in percentage (%).

Among all the isolates *Klebsiella* species has been found to be predominant pathogen (59.10%) followed by *Escherichia coli* (31.94%), *Pseudomonas* (6.4%), *Acinetobacter* (1.9%) and *Citrobacter* species (0.63%). This predominance of *Klebsiella* species was correlated with the study done by Mathur M *et al*.[4] In case of gram positive isolates coagulase negative staphylococci were the most common (91.4%), comparable with the study of Fleer A *et a.l(more than 90%).* [8]

Empirical initial treatment of neonatal sepsis consists of Ampicillin and Aminoglycosides.[9] But results of antibiotic sensitivity of our study revealed that majority of Gram negative isolates (*Klebsiella* species and *Escherichia coli*) were sensitive to MEM (95 % and 97 %), TZP (88 % and 91 %), LVX (84 % and 81 %) and AMC (58%

and 49%) respectively. Where as sensitivity pattern of *Pseudomonas* species was different, *Pseudomonas* species was sensitive to LVX (70%), MEM (65%), AMK (60%), TZP and CAZ (55 % each), suggesting that in comparison to other Gram negative bacilli *Pseudomonas* species was more sensitive to higher Quinolones, Carbapenems, Aminoglycosides, among 3rd generation Cephalosporins to ceftazidime, β lactam + β lactamase inhibitor (Piperacillin+Tazobactam) and Monobactam. In this study the rate of isolation of *Acinetobacter* and *Citrobacter* species was very low (2.53%). In addition to TZP, LVX and MEM, they were also sensitive to Ciprofloxacin.

Table 3a: Antibiotic sensitivity of Gram negative isolates in percentage (%)

Organism	S/I	Drugs											
		AMC	CXA	CRO	CSL	MEM	GEM	AMK	CIP	LVX	TCY	CHL	SXT
Klebsiella spp.	S	58	6	9	88	95	10	38	31	84	14	46	15
	I	11	0.5	0.5	3.2	0	4	5	9	8	8	2	2
E.coli	S	49	7	12	91	91	29	49	24	81	15	33	39
	I	19	3	2	0	0	1	3	12	9	5	6	1
Acinetobacter spp.	S	50	0	17	83	67	33	0	66	83	0	33	0
	I	17	17	33	0	17	17	50	0	0	17	0	0
Citrobacter spp.	S	0	0	50	100	100	50	50	100	100	0	50	50
	I	50	0	0	0	0	0	0	0	0	0	0	0
	S/I	**Drugs**											
		CTX	CAZ	ATM	TZP	MEM	GEM	AMK	CIP	LVX	TCY	CHL	SXT
Pseudo-monas spp.	S	35	25	55	55	65	30	60	35	70	15	5	10
	I	0	0	0	10	5	5	5	5	0	5	0	5

S = Sensitive, I = Intermediate

Table 3b: Antibiotic sensitivity of Gram positive isolates in percentage (%)

Organism	S/I	Drugs											
		PEN	CLO	GEN	CIP	LVX	TCY	CHL	SXT	AZM	CLI	VAN	LNZ
Staphylococci coagulase -ve	S	30	45	46	54	79	40	78	22	40	76	100	97
	I	2	2	7	4	4	7	3	1	6	0	0	0
Staphylococcus aureus	S	25	50	63	50	75	37.5	63	25	38	63	100	87.5
	I	12.5	0	12.5	25	12.5	12.5	12.5	0	25	0	0	0
Streptococci	S	63	50	50	63	63	63	87.5	63	63	100	100	100
	I	0	0	0	12.5	0	12.5	0	0	0	0	0	0

S = Sensitive, I = Intermediate

Among gram positive isolates the coagulase negative staphylococci were most sensitive to vancomycin (100%) followed by linezolid (97%), levofloxacin (79%) chloamphenicol(78%), and clindamycin (76%). Other gram positive isolates (streptococci and staphylococcus aureus) were also sensitive to above mentioned drugs.

CONCLUSION

Neonatal septicemia is the single most important cause of neonatal deaths in the community accounting for over half of them. It is a life-threatening emergency, and rapid treatment with antibiotics is essential for favorable outcome. For effective management of neonatal septicemia cases, the study of bacteriological profile with their antibiotic sensitivity pattern plays a significant role. In view of the above facts the strategy of antibiotic usage in the hospital must be reviewed and we are of the opinion that health care practitioners and policy makers could address this problem by implementing a more rational and appropriate use of antibiotics.

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