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Original Research Article.

Bacteriological Profile and Antibiotic Sensitivity of Organisms Isolated From Neonatal Sepsis at Tertiary Care Hospital

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ABSTRACT

Introduction: As neonatal septicaemia is a life threatening emergency and delays in diagnosis and treatment with appropriate antibiotics may have devastating consequences, surveillance is needed for an ongoing review of the causative organisms and their antibiotic susceptibility pattern.

Aims and Objectives: To identify the common pathogens of the disease as well as the antibiotic susceptibility profile of the pathogens in a particular area.

Materials and Methods: 170 blood samples were collected from neonates with clinically suspected cases of neonatal sepsis admitted in neonatal intensive care unit (NICU) and special care newborn unit (SCNU), RIMS, Ranchi, between the periods of January 2017 to November 2017. The blood sample was inoculated into BD BACTEC Peds plus culture vial. Positive vials were subjected to gram staining, subculture, and antimicrobial susceptibility test.

Results: 75 cases were culture positive among 170 suspected cases. Among culture positive cases there was male predominance (62.7%). Most of the culture positive neonates were preterm i.e. born before 37 weeks (56%). Among the culture positive cases early onset sepsis (64%) was more. Respiratory distress secondary to birth asphyxia was the most common clinical presentation (51.8%). Gram negative bacteria were most common isolate being responsible for 62.7% of cases of septicemia. *Klebsiella pneumoniae* was found to be the most common isolate followed by CONS (*coagulase negative Staphylococcus).*

Conclusion: The antibiotic abuse has resulted in confusion in diagnosis and the emergence of drug resistant bacterial strains in the nurseries with grave sequelae. Proper hand washing and aseptic obstetric procedures, high incidence of suspicion, prompt diagnosis, aggressive management of sepsis and timely identifying high risk factors can help to prevent neonatal sepsis.

Keywords: Neonatal Septicaemia, Early Onset Sepsis, *Klebsiella Pneumonia, Coagulase Negative Staphylococcus.*

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INTRODUCTION

Neonatal septicemia refers to a clinical syndrome characterized by systemic signs and symptoms due to generalized bacterial infection with a positive blood culture in the first four weeks of life.[1,2] It is one of the leading cause of neonatal mortality and morbidity in India.[3,4]

Bacterial infections are the commonest cause for neonatal septicemia. Fulminant and fatal course of infection may result from complications such as shock, disseminated intravascular coagulation and multi-system organ failures. Thus, the early diagnosis of this life threatening condition, is mandatory for a timely treatment and a favourable outcome.[1,5,6]

Based on the timing of the infection neonatal sepsis has been classified into early onset sepsis (EOS) and late onset sepsis (LOS). Early onset sepsis is defined as onset of sepsis before one week of life and late onset sepsis is defined as onset of sepsis after one week of life.[7]

Early onset infections are caused by organisms prevalent in the maternal genital tract or in the delivery area. The associated factors for early-onset sepsis include low birth weight, prolonged rupture of membranes, foul smelling liquor, multiple per vaginal examinations, maternal fever, difficulty or prolonged labour and aspiration of meconium. Early onset sepsis manifests frequently as pneumonia and less commonly as meningitis.

Late onset septicemia is caused by the organisms thriving in the external environment of home or the hospital. The infection is often transmitted through the hands of the care-providers. The onset of symptoms is usually delayed beyond 72 hours after birth and the presentation is that of septicemia, pneumonia or

meningitis. The associated factors of late onset sepsis include low birth weight, lack of breastfeeding, superficial infections (pyoderma, umbilical sepsis), aspiration of feeds, disruption of skin integrity with needle pricks and use of intravenous fluids.

As neonatal septicemia is associated with high mortality and morbidity, rapid diagnosis and prompt treatment with appropriate antibiotics is essential to avoid indiscriminate use of antibiotics in those neonates with sepsis and to avoid unnecessary use of antibiotics in those who do not have septicemia.

MATERIALS AND METHODS

A cross sectional study was conducted in the Department of Microbiology at Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, between the period of January 2017 to November 2017.

170 blood samples were collected from neonates with clinically suspected cases of neonatal sepsis admitted in neonatal intensive care unit (NICU) and special care newborn unit (SCNU), RIMS, Ranchi, after obtaining ethical clearance.

Inclusion Criteria

All the blood samples which came for culture from the neonatal ICU with clinical suspicion of sepsis (i.e neonates with poor activity, fever, refusal of feed, lethargy, tachypnea, tachycardia, birth asphyxia, prematurity, low birth weight etc) were taken into study group except for ones which come under the exclusion criteria.

Exclusion Criteria

Neonates with age more than 28 days or neonates on antibiotics prior to collection of blood were excluded from the study.

Sample Collection and Processing

The blood sample was taken from peripheral vein under aseptic conditions. The local site was cleansed with 70% alcohol and providine iodine (1%) followed by 70% alcohol again. Approximately, 1-2 ml of venous blood was collected using blood collection set or other tubing like 'butterfly' set. The blood sample was inoculated into BD BACTEC Peds plus culture vial and the septum was swabbed with alcohol before inoculation. The inoculated BD BACTEC vial was brought to the Department of Microbiology, RIMS, and processed further. The inoculated vials were placed in the BD BACTEC FX 200 system which is a fluorescent series instrument, for incubation and monitoring.

Positive vials were subjected to gram staining, subculture, and antimicrobial susceptibility test. The vials were declared negative by the system after five days of aerobic incubation.

For subculture, the fluid was inoculated on MacConkey agar and Blood agar plates and incubated at 37^0C for 18-24 hrs. After 24 hrs, the plates were observed for any growth. The colonies were identified by gram's staining, motility test and standard biochemical tests.

The antimicrobial susceptibility testing of isolates was done by the standard disc diffusion method (Kirby Bauer method) using commercial discs according to CLSI guidelines.

Table 01: Sex Wise Distribution of Cases

Sex	Suspected cases		Culture positive cases	
	Number	Percentage	Number	Percentage
Males	104	61.1	47	62.7
Females	66	38.9	28	37.3
Total	170	100	75	100

Table 02: Distribution of Cases According to Gestational Age.

Gestational age	Suspected cases		Culture positive cases	
	Number	Percentage	Number	Percentage
Preterm (<37 weeks)	92	54.1	42	56
Term (≥37 weeks)	78	45.9	33	44
Total	170	100	75	100

Table 03: Bacterias Isolated by Blood Culture

Sl.No.	Name of organism	Isolates	
		Number	%
1.	***Klebsiella pneumoniae***	27	36
2.	***Coagulase negative staphylococcus* (CONS)**	18	24
3.	***Escherichia coli***	10	13.3
4.	***Staphylococcus aureus***	8	10.7
5.	***Pseudomonas aeruginosa***	6	8
6.	***Acinetobacter spp***	4	5.3
7.	***Enterococcus spp***	2	2.7
	Total	75	100

Table 04: Antibiotic Susceptibility Pattern among Gram Positive Organism

Sl. No.	Antibiotics	Sensitive	%	Resistant	%
1.	Amoxicillin	9	32.2	19	67.8
2.	Ciprofloxacin	20	71.4	8	28.6
3.	Chloramphenicol	19	67.8	9	32.2
4.	Cefoxitin	28	100	0	0
5.	Clindamycin	23	82.2	5	17.8
6.	Erythromycin	8	28.6	20	71.4
7.	Gentamicin	11	39.2	17	60.8
8.	Linezolid	28	100	0	0
9.	Tetracycline	20	71.4	8	28.6
10.	Vancomycin	28	100	0	0

Table 05: Antibiotic Susceptibility Pattern among Gram Negative Organism

Sl. No.	Antibiotics	Sensitive	%	Resistant	%
1.	Amikacin	33	70.2	14	29.8
2.	Ampicillin	5	10.6	42	89.4
3.	Cefotaxime	24	51	23	49
4.	Cefoperazone	22	46.8	25	53.2
5.	Colistin	47	100	0	0
6.	Ceftazidime	26	55.3	21	44.7
7.	Ceftriaxone	23	49	24	51
8.	Imipenem	47	100	0	0
9.	Levofloxacin	29	61.7	18	38.3
10.	Piperacillin + Tazobactam	38	80.8	9	19.2

RESULTS

75 cases were culture positive among 170 suspected cases. Among culture positive cases there was male predominance (62.7%) and most of them were preterm i.e. born before 37 weeks (56%). It was seen that among the culture positive cases early onset sepsis (64%) was more. Respiratory distress secondary to birth asphyxia was the most common clinical presentation (51.8%). Gram negative bacteria were most common isolate being responsible for 62.7% of cases of septicemia. *Klebsiella pneumoniae* was found to be the most common isolate followed by CONS (*coagulase negative Staphylococcus)* accounting for 36% and 24% cases respectively.

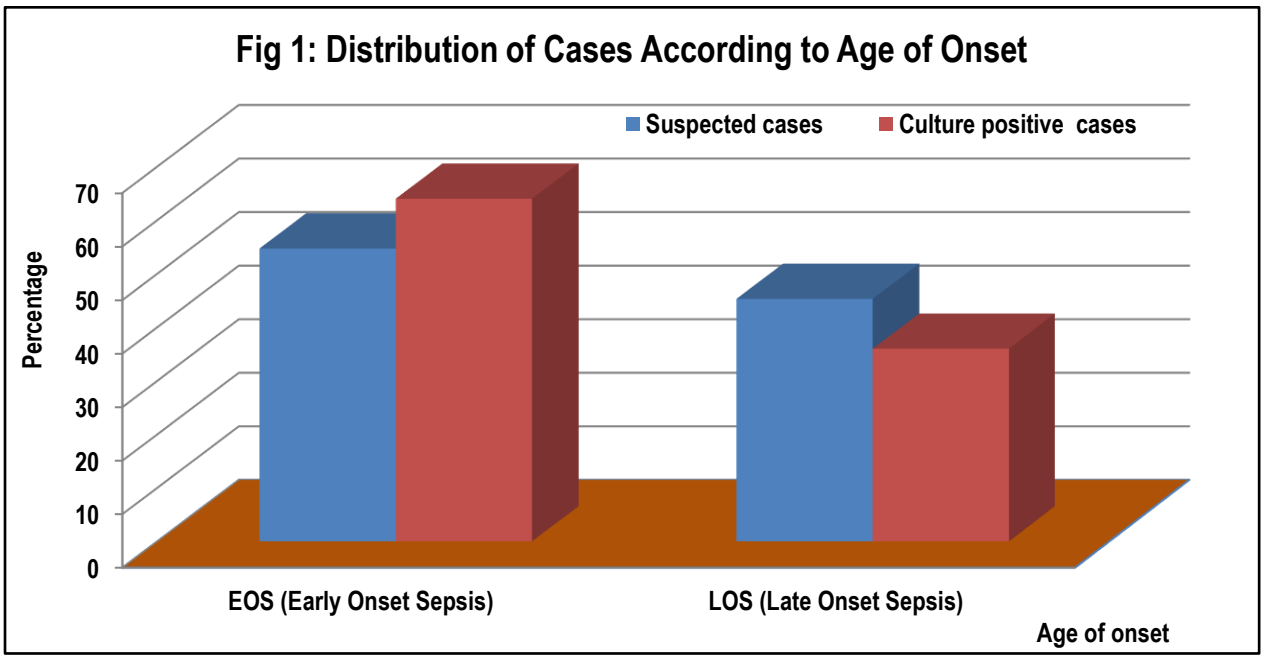


Fig 2: Distribution of Cases in Relation to Clinical Features (Signs And Symptoms)

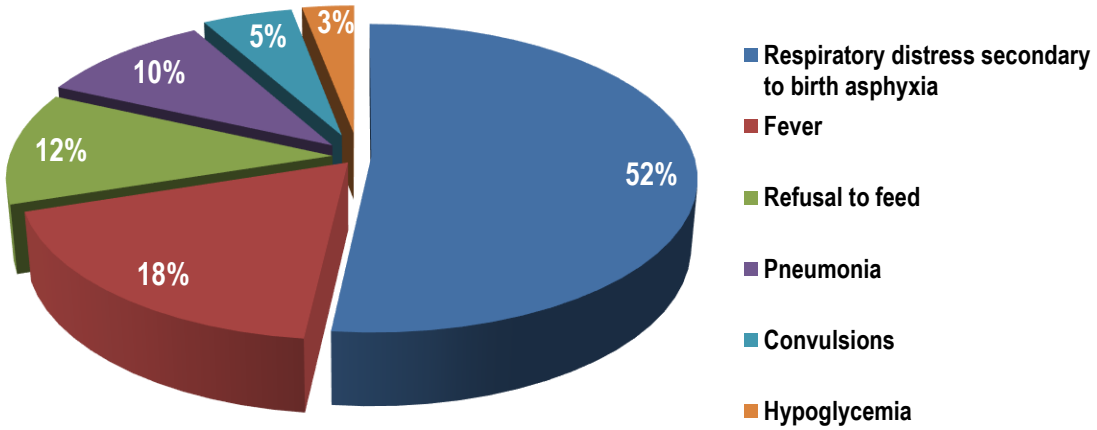


Fig 3: Results of Blood Culture

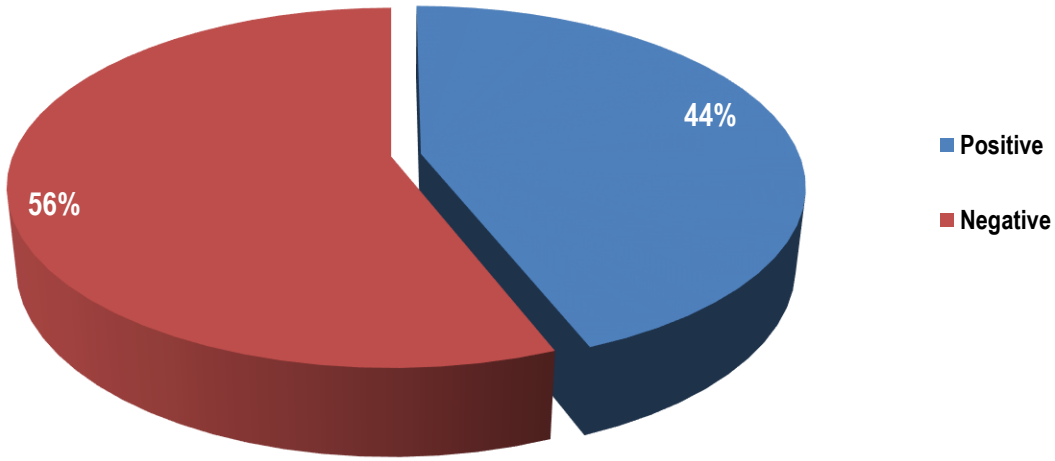
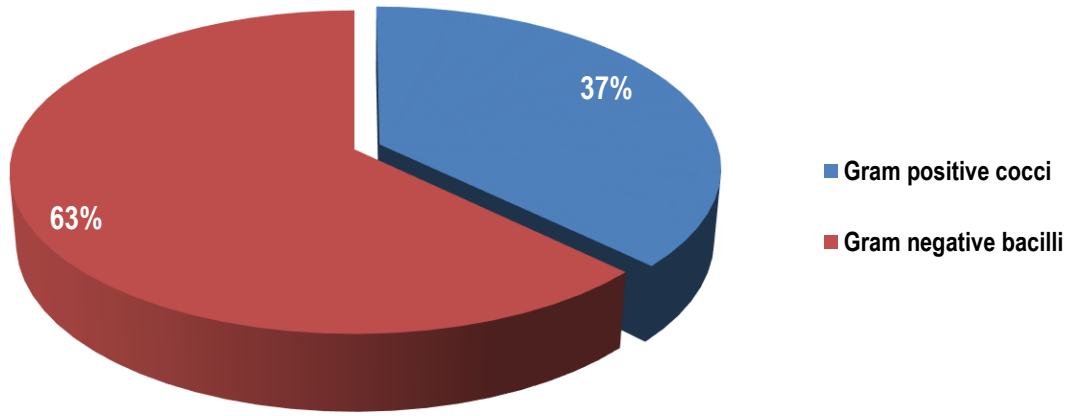


Fig 4: Type of Bacteria in Gram Stain Smear Study



DISCUSSION

In present study neonatal septicemia was more common in males (62.7%) as compared to females (37.3%). The male to female ratio in our study was 1.67:1 which correlated with the studies of S Thakur et al[8] and M. Mustafa et al[9] who have also reported male preponderance in their study. In present study 56% preterm neonates and 44% term neonates were blood culture positive. In the study conducted by E.M.R.S. El. Din et al[11], 58.9% of neonates were preterm and study by C. M. Sharma et al[10] showed that 47.04% of neonates were preterm who developed neonatal septicemia. This shows that preterm neonates are more prone to develop sepsis because of their immature immune system.

In present study, maximum culture positive cases were seen in neonates less than one week of age (early onset septicemia) i.e. 64% as compared to neonates aged more than one week (late onset septicemia) i.e. 36%. This correlated with the studies done by V. Vijayvergia et al[12], V. A. Muley et al[13] and O. Peterside et al[14] who reported a higher proportion of early onset septicemia cases. In present study respiratory distress secondary to birth asphyxia was the commonest clinical presentation (51.8%) which was consistent with the finding of S. Thakur et al[8] who reported it to be 48%.

Fever was the 2nd most common symptom present in 18.2% of cases in the present study which correlated with the study of T. V. Mhada et al[15] and S. Thakur et al[8] who reported fever 21.9% and 20% respectively. In present study, out of 170 suspected cases of neonatal septicemia, 75 cases were positive by blood culture i.e. 44.1%. which correlates with the studies of V. Vijayvergia et al[12], S. Thakur et al[8], M. Mustafa et al[9] and A.J.Shah et al[17].

In present study gram negative bacilli were more frequently (62.7%) involved in causing neonatal septicemia than gram positive cocci (37.3%) which was consistent with the studies done by M. Mustafa et al[9], D.E. Premalatha et al[16], V. Vijayvergia et al[12], V. A. Muley et al[13] and P. Jyothi et al[18].

In present study out of 75 culture positive cases, the most predominant isolate was *Klebsiella pneumoniae* (36%). This finding was in concordance with the study carried out by M. Mustafa et al[9](35.4%), D.E. Premalatha et al[16] (38.09%) and P. Jyothi et al[18] (30.5%). *Coagulase negative staphylococcus* (CONS) was the second most common isolate found (24%). This finding correlates with the studies of D. E. Premalatha et al[16] (28.57%), P. Jyothi et al[18] (27.5%) and S. Thakur et al[8] (31%).

All strains of gram positive cocci were 100% sensitive to Cefoxitin, Linezolid and Vancomycin, 82.2% were sensitive to Clindamycin, 71.4% were sensitive to Ciprofloxacin and Tetracycline. Resistance was maximum to Erythromycin (71.4%) followed by Amoxicillin (67.8%) and Gentamicin (60.8%). Organisms were sensitive to Cephalosporins to a higher degree than to Penicillin. V. Vijayvergia et al[12] and M. Mustafa et al[9] in their study also reported 100% sensitivity to Linezolid, Vancomycin and maximum resistance to Erythromycin.

All strains of gram negative isolates were 100% sensitive to Colistin and Imipenem. 80.8% were sensitive to Piperacillin + Tazobactum and 70.2% were sensitive to Amikacin. Maximum resistance was seen to Ampicillin (89.4%) followed by third generation Cephalosporins .M. Mustafa et al[9] in their study also reported 100% sensitivity to Colistin and Imipenem. M. Mustafa et al[9] and P. Jyothi et al[18] in their study reported maximum resistance to Ampicillin.

CONCLUSION

Health education should be provided to the public on the dangers of indiscriminate use of antibiotics, which is currently considered to be a menace in our society and which has been responsible for the ineffectiveness of most commonly used antibiotics. A periodic review of the antibiotic policy of the hospital is necessary. Therefore to reduce the load of neonatal sepsis, possible strategies could be hand hygiene practice, barrier nursing, promotion of clean deliveries, exclusive breast feeding, rationalization of admissions to and discharge from neonatal units.

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