

Bacteriological Profile and Antibiotic Sensitivity Pattern in Community Acquired Neonatal Sepsis in Rajsamand – A Hospital Based Prospective Study

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ABSTRACT

Background: To isolate the pathogenic bacteria and to know the antibiotic sensitivity in the community acquired neonatal sepsis.

Materials & Methods: It was a prospective study undertaken on 120 neonates suspected of community acquired neonatal sepsis admitted in Pediatrics Department of AIMSRC over a period of two year. All these cases fulfilled the inclusion criteria required for the study. Blood culture of these cases was performed by Mackie and McCartney method and antibiotic sensitivity by Kirley-Baner's disc diffusion method.

Results: Out of 120 cases, 88 cases showed positive blood culture. Gram negative isolates (N=55) were more frequent than gram positive isolates (N=33). Most common isolate was Klebsiella, Pneumoniae followed by Staphylococcus Aureus, E. Coli, Pseudomonas Aeruginosa, Acinetobacter. Both gram negative as well as gram positive isolates showed high resistance to ampicillin and gentamycin. Gram negative isolates were highly sensitive to Colistin Sulphate and Meropenem whereas gram positive isolates were highly sensitive to Linezolid and Vancomycin. **Conclusion:** Gram negative bacteria were more frequent causes of community acquired neonatal septicemia than gram positive isolates. Both gram positive and negative isolates showed poor sensitivity towards conventional first line antibiotics, rather were mainly susceptible to higher antibiotics. So, the knowledge of the pattern of bacteriological isolates and their antimicrobial susceptibility pattern can be very helpful for prompt treatment of such patients, to decrease neonatal morbidity and mortality as well as reducing the emergence of multi-drug resistant organisms.

Key words: Antibiotic susceptibility; Bacterial isolates; Bacterial resistance; Neonatal sepsis.

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INTRODUCTION

Neonatal Sepsis refers to the invasive bacterial infection occurring in the first 4 weeks of life. It encompasses various infections of the new born like septicemia, meningitis, arthritis, osteomyelitis and urinary tract infection but excludes superficial infections like conjunctivitis and oral thrush.^[1] It can be early onset sepsis(EOS) presenting within 72 hours of life with maternal genital tract being the main source of infection or it can be late onset sepsis (LOS) which usually presents after 72 hours of life and the main source of infection is nosocomial (hospital acquired)or community acquired infection.^[2,3] Neonatal sepsis, the commonest cause of neonatal morbidity and mortality is responsible for 30-50% of total neonatal deaths each year in the developing

countries.^[4-6] According to the World Health Organization (WHO) estimate, there are about 5 million neonatal deaths per year in the world, 98% of these occurring in the developing world. Neonatal mortality rate in developing countries from various causes is about 34 per 1000 live births, most of the deaths occurring in the first week of life. Globally, major causes of the neonatal deaths are due the prematurity (28%), sepsis (26%), and birth asphyxia (23%).^[7] The incidence of the neonatal sepsis according to the Neonatal and Perinatal Database (NNPD) is 30 per 1000 live births. The NNPD network comprising of the 18 tertiary care neonatal units across India found sepsis to be the commonest cause of neonatal mortality contributing to 19%

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of all neonatal deaths.^[8] In India, sepsis has been reported as a cause of neonatal deaths in 20-50% of cases in the community based studies.^[9,10] The gold standard for the diagnosis of neonatal sepsis is isolation of bacterial agents from the blood culture.^[11] Both gram negative and gram positive bacteria have been isolated from the blood and predominance of one type over the other varies from place to place and even in the same place over the time to time.^[12] In most of the developing countries, gram negative sepsis remains the major cause of the neonatal septicemia. Commonly isolated organisms include Klebsiella Pneumonia, Escherichia Coli, Enterobacilli, Pseudomonas Aeruginosa, Staphylococcus Aureus, Streptococcal Species, Citrobacter Species and Coagulase Negative Staphylococcus (CoNS).^[13,14] So, this study was undertaken with the aim to determine the bacteriological profile and its antibiotic susceptibility pattern in the community acquired neonatal sepsis. Following a rational antibiotic therapy, we can minimize the risk of severe neonatal morbidity and mortality as well as decrease the development of multidrug resistant bacteria.

METHODS

It was a hospital based prospective study conducted in the department of Pediatrics, AIMSRC, Rajsamand. It included 120 neonates admitted with clinically suspected community acquired sepsis during the period of two year. Only those neonates were included who were less than 28 days of life, had clinically suspected septicemia and presented after 72 hours of birth. Neonates of more than 28 days of life or presenting before 72 hours of life or already on antibiotics were excluded from the study. Sepsis was suspected from the clinical history of one or more of the symptoms like refusal to feed, lethargy, fever, abdominal distension, loose stools, vomiting, features of hypoglycemia, hypothermia, tachypnea, tachycardia, grunting, chest retractions, cyanosis, apnea, pallor, shock, excessive crying, body mottling, poor cry, prolonged capillary time, bleeding from any site, neck retractions and vacant stare. With all the recommended aseptic precautions, 1ml of blood was drawn from each neonate and collected in a sterile bottle containing 1% glucose broth and inoculated at 37°C. Subcultures were made on blood agar and Mac-Conkey agar after 24 hours, 48 hours, 72 hours and 7 days which were further inoculated at 37°C for 18-24 hours. The plates were observed the next day. If no growth was observed even after 7th day, sample was reported negative for bacterial isolate. The growth of isolates were identified by colony morphology, gram staining and standard biochemical tests described in Mackie and McCartney Practical Medical Microbiology.^[16] For identification of gram positive isolates catalase and coagulase tests were done; for gram negative organisms, Simons's citrate test, motility indole test, urea (MIU) test and triple sugar test (TST) were done. Antibiotic susceptibility test was performed on the identified isolates using commercially prepared antibiotics disks (High media Co. Mumbai, India) on Muller Hinton agar by Kirby-Baur Disk Diffusion method as recommended in the Clinical Laboratory Standard Institute (CLSI) guidelines.^[15]

RESULTS

Out of 120 study cases, 73 (61.24%) were males and 47 (38.76 %) were females. Three most frequent features

suggestive of septicemia were refusal to feed (n= 92; 77%), lethargy (n= 80; 66.66%) and fever (n= 59; 49 %) followed by other clinical features. 88 (73.33%) showed positive blood culture and 32 (26.66 %) showed no bacterial growth. Gram negative isolates (n =55; 62.5 %) were more frequent than gram positive growths (n=33; 37.5 %). The most common pathogen isolated was Klebsiella pneumoniae (n= 28) followed by other organisms and CONS was the least common bacterial isolate [Table 1]. The gram-negative isolates showed high resistance to Ampicillin and Gentamycin but were highly sensitive to Colistin Sulphate and Meropenem [Table 2]. Gram positive isolates were also quite resistance to Ampicillin and Ceftazidime but were highly sensitive to Linezolid and Vancomycin [Table 3].

Table 1: Organisms Isolated.

Organisms Isolated	Number(N=88)	Percentage
Gram Negative (55)		
Klebsiella Pneumonia	28	31.81
Escherichia Coli	14	18.33
Pseudomonas	12	16.12
Acinetobacter	3	3.62
Gram Positive (33)		
Staphylococcus Aureus	22	28.85
Enterococcus	1	1.28
Coagulase Negative Staphylococci (CoNS)	7	

Table 2: Antibiotic Susceptibility Pattern of Gram Negative Isolates. (n=55)

Antibiotic	Gram Negative	Percentage
Amikacin	34	61.8
Gentamicin	21	38.1
Ceftriaxone	24	43.6
Piperacillin-Tazobactam	23	41.8
Imipenem	53	96.36
Colistin Sulphate	54	98.18
Ceftazidime	25	46.28
Ciprofloxacin	36	65.4
Ampicillin	2	3.63
Cefotaxime	25	46.28
Cefoperazone	26	46.78

Table 3: Antibiotic Susceptibility Pattern of Gram Positive Isolates. (n=33)

Antibiotic	Gram Positive	Percentage
Amikacin	30	90.9
Gentamicin	14	42.4
Ceftriaxone	16	48.4
Linezolid	32	96.9
Amoxicillin- Clavulanate	15	45.4
Ceftazidime	4	12.1
Vancomycin	31	93.9
Ciprofloxacin	18	54.5
Ampicillin	2	6
Cefotaxim	17	51.5
Methicillin	29	87.8
Cefoperazone	18	54.5

DISCUSSION

Neonatal Sepsis is a life-threatening emergency and any delay in its treatment may lead to mortality.^[4,7] Bacteriological profile of community acquired neonatal sepsis changes from region to region and time to time. In addition, there is increasing multidrug resistance over the last few years.

Therefore, knowledge of pattern of the bacteriological profile and its antimicrobial susceptibility pattern can be very helpful for prompt empirical treatment of neonatal sepsis. This study was undertaken keeping these objectives in mind.

Out of 120 study cases; male to female ratio 1.5:1 which is comparable to other studies like by Begums et al.^[16] Reason for male preponderance may be Social and Sex dependent factors as X-linked immunoregulatory genes may play some protective roles in females.^[17] Positive blood culture was observed in 73% cases in the present study which is comparable to study by Premlata et al.^[18] showing blood culture positivity in 82% cases although the results are higher as compared to Karthikeyan et al.^[19] showing blood culture positivity in 51% cases. The difference may be due to variable incidence of neonatal sepsis from place to place and due to many other factors like perinatal care, birth weight etc. Gram negative isolates (62.50%) were more frequent than gram positive (37.50%). These results were consistent with the NNPD data. Out of all culture positive cases, *Klebsiella pneumoniae* was most frequent (31.81%) gram negative isolate and *Staphylococcus Aureus* was the most common (28.85%) gram positive isolate. These results are similar to many other Indian studies. Most of the gram-negative isolates in the present study were resistant to the routinely used first line empirical antibiotics with 96.15% resistant to Ampicillin and 58.34% to Gentamicin. But all the negative organisms showed 100% sensitivity to Colistin Sulphate to Imipenem. Our findings correlate well to those of Mustafa et al and many other studies.^[20] Out of gram positive isolates, again 93.82% were resistant to routinely used first line antimicrobial Ampicillin and 42.40% were resistant to Gentamicin whereas 96.90% gram positive isolates were sensitive to Linezolid, 90.90% were sensitive to Amikacin and 93.90% to Vancomycin. Our findings again correlate well with those reported by Mustafa et al and Kaistha et al.^[20,21] Increasing resistance by both gram positive and gram negative isolates to routinely used antimicrobials may be due to inappropriate use of antibiotics.

CONCLUSION

Gram negative organisms were more frequent causes of community acquired (CA) neonatal septicemia than gram positive isolates. *Klebsiella Pneumoniae* was the most common, *Staphylococcus Aureus* was the second most common and CoNS was the least common organisms isolated. Both gram negative and gram positive showed poor sensitivity towards routinely used first line antimicrobials like

Ampicillin and Gentamicin. Gram-negative organisms were highly sensitive to Colistin Sulphate, Imipenem, Ciprofloxacin, Amikacin and third generation Cephalosporins in the descending order. Gram-positive isolates were mainly sensitive to Linezolid, Amikacin, Vancomycin, Methicillin, Ciprofloxacin and third generation Cephalosporins in descending order. Therefore, the bacteriological profile and the sensitivity pattern of Community acquired neonatal septicemia in a particular geographical area must be considered before deciding the empirical antibiotic treatment of community acquired neonatal septicemia.

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