Original Research Article

Community Acquired Neonatal Sepsis: A Study Of Bacteriological Profile And Antibiogram

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Abstract

Objective: Neonatal sepsis is a major cause of morbidity and mortality of newborns (< 1 month of age). Septicemia and drug resistance is a predominant issue for neonatal death in Bihar. This study is intended to find bacteriological profile of community acquired neonatal sepsis and antibiotic susceptibility pattern of the isolates from neonates**. Methods:** It was a prospective study undertaken on 310 neonates suspected of community acquired neonatal sepsis. All these cases fulfilled the inclusion criteria required for the study. Blood culture of thesecases was performed by Mackie and McCartney method and antibiotic sensitivity by Kirley-Baner's disc diffusion method. **Results:** 240 (77.4%) cases showed positive blood culture. Gram negative isolates (N=158;65.83%) were more frequent than gram positive isolates (N=82;34.16%). Most common isolate was Klebsiella Pneumoniae (N=78%;32.50%) followed by Staphylococcus Aureus (N=67;27.91%), E.Coli (N=38;15.83%), Pseudomonas Aeroginosa (N=28;11.66%), Acinetobacter(N=14;5.83%), Enterococcus(N=8;3.33%) and Coagulase Negative Staphylococcus Aureus (N=7;2.91%). Both gram negative as well as gram positive isolates showed high resistance to ampicillin and gentamycin. Gram negative isolates were highly sensitive to Polymixin B and Meropenem whereas gram positive isolates were highly sensitive to Linezolid andVancomycin. **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 isolatesand 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.

Keywords: Antibiotic susceptibility; Bacterial isolates; Bacterial resistance; Neonatal sepsis.

Introduction

Neonatal sepsis is a clinical syndrome (sepsis neonatorum) resulting from the pathophysiologic effects of local or systemic infection. It affects newborns below 1 month of age and encompasses systemic infections including meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infections[1].

Neonatal sepsis is classified as early onset when it occurs within the first 72 hours of life and late onset when it occurs after 72 hours of life (Al-Zwani, 2002; Chacko and Sohi, 2005).Early onset sepsis is caused by organisms prevalent in the maternal genital tract, labor room or operating theatre while late onset sepsis usually results from nosocomial 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]. Neonatal mortality rate in developing countries from various causes is about 29 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]. 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].

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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 Aeroginosa, Staphylococcus Aureus, Streptococcal Species, Citrobacter Species and Coagulase Negative Staphylococcus (CONS)[13,14]. The bacterial susceptibility to different antibiotics varies from time to time over different geographical areas. But there is a rising concern of isolation of highly antibiotic resistant bacteria[15]. Thus the knowledge of the bacteriological profile of neonatal septicemia and its antibiotic susceptibility pattern in geographical areas provide us the guidance to initiate empirical antibiotic treatment which is the hallmark of the management of the neonatal sepsis. 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.

Materials and methods

This prospective randomized study was conducted at Upgraded Department of Paediatric and Neonatology, at Patna Medical College and Hospital, Patna. The study was approved by the institutional research and ethical committee. The study was conducted between September 2020 and July 2021. An informed and written consent was taken from the participating subjects prior to the commencement of the study.

It included 310 neonates admitted with clinically suspected community acquired sepsis. 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 orpresenting before 72 hours of life or already on antibiotics were excluded from the study. Sepsis wassuspected 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.

Blood sample was collected from a peripheral vein under aseptic conditions. Approximately, 1-3 ml of blood was inoculated into "BacT/ALERT PF Plus" aerobic pediatric culture bottle aseptically. Blood culture was performed using a Bectec Dickson ped plus aerobic bottles and incubation was performed in Bactec 9240 system. All the bottles were subjected to gram stain and subculture on Blood agar and MacConkey Agar. The plates were incubated at 37oC for 24hrs. Growth was identified by colony morphology, gram stain and standard biochemical tests. (Mackie and McCartney, 2006).

Results

Out of 310 study cases, 172 (55.48%) were males and 138 (44.51 %) were females. Three most frequent features suggestive of septicemia were refusal to feed (n= 235; 75.80%), lethargy (n= 206; 66.45%) and fever (n= 149; 48.06 %) followed by other clinical features. 240 (77.4%) showed positive blood culture and 70 (22.58 %) showed no bacterial growth. Gram negative isolates (n =158; 65.83%) were more frequent than gram positive growths (n=82; 34.16 %). The most common pathogen isolated was Klebsiella pneumoniae (n= 78; 32.5 %) 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 Polymyxin-B and Meropenem [Table 2]. Gram positive isolates were also quite resistance to Ampicillin and Gentamycin but were highly sensitive to Linezolid and Vancomycin [Table 3].

Table 1: Organisms Isolated

Organisms Isolated	Number(N=240)	Percentage
Klebsiella Pneumonia	78	32.5
StaphylococcusAureus	67	27.91
Escherichia Coli	38	15.83
Pseudomonas	28	11.66
Acinetobacter	14	5.83
Enterococcus	8	3.33
Cons	7	2.91

Table 2: Antibiotic Susceptibility Pattern of GramNegative Isolates

Antibiotic	Gram Negative	Percentage
Amikacin	104	65.82
Gentamicin	66	41.77
Ceftriaxone	78	49.36
Piperacillin- Tazobactam	74	46.83
Linezolid	Nt*	Nt*
Amoxycillin- Clavulanate	Nt*	Nt*
Imipenem	156	98.73
Polymyxin-B	158	100
Ceftazidime	76	48.10
Vancomycin	Nt*	Nt*
Ciprofloxacin	106	67.08
Ampicillin	7	4.43
Cefotaxim	77	48.73
Methicillin	Nt*	Nt*
Cefoperazone	74	46.83
*NT = Not Tested		

Table 3: Antibiotic Susceptibility Pattern of GramPositive Isolates

Antibiotic	Gram Positive	Percentage
Amikacin	76	92.68
Gentamicin	36	43.90
Ceftriaxone	44	53.65
Piperacillin- Tazobactam	Nt*	Nt*
Linezolid	82	100
Amoxycillin- Clavulanate	42	51.21
Imipenem	Nt*	Nt*
Polymixin-B	Nt*	Nt*
Ceftazidime	9	10.9
Vancomycin	75	91.46
Ciprofloxacin	52	63.41
Ampicillin	6	7.31
Cefotaxim	44	53.65
Methicillin	71	86.58
Cefoperazone	53	64.63
*NT = Not Tested		

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 promptempirical treatment of neonatal sepsis. This study was undertaken keeping these objectives in mind. Out of 310 study cases; male to female ratio 1.24:1 which is comparable to other studies like by Begumset al[18]. Reason for male preponderance may be sex dependent factors as X-linked immunoregulatory genes may play some protective roles in females[19]. Positive blood culture was observed in 77.4% cases inthe present study which is comparable to study by Premlata et al[20]. showing blood culture positivity in82% cases although the results are higher as compared to Karthikeyan et al[21]. showing blood culture positivity in 51% cases. The difference maybe due to variable incidence of neonatal sepsis fromplace to place and due to many other factors like perinatal care, birth weight etc. Gram negative isolates (65.83%) were more frequent than gram positive (34.16%). These results were consistentwith the NNPD data. But our results are in contrast to studies from developed countries showing gram positive isolates more frequently[22]. Out of all culture positive cases, Klebsiella pneumonia was most frequent (32.50%) gram negative isolate and Staphylococcus Aureus was the most common(27.91%) 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 95.57% resistant to Ampicillin and 58.23% to Gentamicin. But all the negative organisms showed 100% sensitivity to Polymixin B, 98.73% to Imipenem, 67.08% to Ciprofloxacin and 65.82% to Amikacin. Our findings correlate wellto those of Mustafa et al and many other studies[23]. Out of gram positive isolates, again 92.69% were resistant to routinely used first line antimicrobial Ampicillin and 56.10% were resistant to Gentamicin whereas 100% gram positive isolates were sensitive to Linezolid, 92.68% were sensitive to Amikacin and 91.46% to Vancomycin. Our findings again correlate well with those reported by Mustafa et al and Kaistha et al[23,24]. 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 aquired (CA) neonatal septicemia than gram positive isolates. Klebsiella Pneumoniae was the most common, Staphlyococcus 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 Polymixin-B, Imipinem, 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. The higherantibiotics like the Polymixin B, Linezolid and Vancomycin should be kept reserved for multidrug resistance bacteria. Judicious or rational use of antibiotic can serve the dual purpose of not only reducing the neonatal morbidity and mortality but also reducing the multi-drug resistance rising to the dangerous level.

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