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Research Article

Microbiological study of neonatal sepsis in a tertiary care hospital of western Uttar Pradesh, India

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ABSTRACT

Background: Neonatal sepsis is a clinical syndrome characterized by systemic signs of infection and accompanied by bacteraemia in the first month of life. Neonatal sepsis is among the three most common illnesses among newborns, and second most common cause of neonatal mortality especially among preterm and low birth weight babies. Aim of the study was to identify the common bacterial pathogens associated with neonatal sepsis and their antibiotic susceptibility pattern.
Methods: Total 120 blood samples collected aseptically (from January 2015 to April 2015) and cultured in automated machine Versa TREKTM automated microbial detection system. Significant bacterial colonies are seen on streak lines which were observed by their diameter, opaqueness, flatness, regular or irregular margins etc. Any growth was subjected for identification by appropriate biochemical tests. Antibiotic susceptibility testing was done.
Results: Out of one hundred twenty (120) samples, eighty (66.67%) samples were found positive for bacterial infection. In which 22 (27.50%) *E.coli*, 14 (17.50%) *Klebsiella pneumonia*, 10 (12.50%) *pseudomonas*, 17 (21.25%) *Staphylococcus aureus*, 6 (7.50%) coagulase negative *staphylococci* (CoNS) and 11(13.75%) *Enterococcous sp*. was identified.
Conclusions: The blood culture positivity rate was 66.67%. E. coli, Klebsiella spp, and *Staphylococcus aureus* was the commonest agent.

Keywords: Neonatal septicaemia, Blood culture, Antibiotic susceptibility pattern

INTRODUCTION

Neonatal sepsis is a clinical syndrome characterized by systemic signs of infection and accompanied by bacteraemia in the first month of life. Neonatal sepsis is among the three most common illnesses among newborns, and second most common cause of neonatal mortality especially among preterm and low birth weight babies.[1]

According to world health organisation estimate, there are about 5 million neonatal deaths each year, 98% of death occurring in develop countries. Neonatal sepsis is responsible for 30% to 50% of total neonatal deaths each year in developing countries. Infections are estimated to cause 1.6 million deaths annually. Sepsis and meningitis are the most commonly implicated factor for most of these death.[2] In India, the incidence of blood culture proven sepsis was reported as 8.5 per 1,000 live births for the year 2002–2003 by the National Neonatal Prenatal Database.[3]

Most of the neonatal sepsis related deaths are preventable if suspected early and treated with appropriate antibiotics. Neonatal sepsis is broadly categorized into early and late onset sepsis depending upon the postnatal day of presentation. Early-onset neonatal sepsis (EONS) occurs within first 72 h of life, while the late-onset neonatal sepsis (LONS) occurs between 72 h to 90 days of life.[4,5] Because of the different pathogens involved in neonatal

sepsis of onset, appropriate management and care depends on knowledge about the causative organisms and their sensitivity to antibiotics. The present study focused on isolation and determination of antimicrobial activity of neonatal sepsis causing bacteria.

METHODS

Study was conducted in NICU, Dept. of Microbiology, LLRM Medical College, Meerut, Uttar Pradesh, India. Total 120 blood samples collected from January 2015 to April 2015 aseptically and cultured in automated machine Versa TREK^{TM} automated Microbial Detection system. After the incubation of 5-6 hours positive samples sub cultured on blood agar and MacKoncy agar and incubate at 37^{0}C for overnight. Significant bacterial colonies are seen on streak lines which were observed by their diameter, opaqueness, flatness, regular or irregular margins etc. Identification is done by biochemical test, drug susceptibility test also done by Kirby bauer disc diffusion method.

RESULTS

Out of one hundred twenty (120) samples, eighty (66.67%) samples were found positive for bacterial infection. Gram negative isolates (57.5%) were more as compared with Gram positive isolates (42.5%). In which 22 (27.50%) *E.coli*, 14 (17.50%) *Klebsiella pneumonia*, 10(12.50%) *pseudomonas*, 17 (21.25%) *Staphylococcus aureous*, 6 (7.50%) coagulase negative *staphylococci* (CoNS) and 11 (13.75%) *Enterococcous sp*. was identified (Table 1).

Table 1: Isolated bacterial species and their percentage from blood sample.

Isolated bacteria	No. of cases	Percentage
E. coli	22	27.50%
Klebsiella species	14	17.50%
Pseudomonas aerrugenosa	10	12.50%
Staphylococcus aureus	17	21.25%
CoNS	6	7.50%
Enterococcus	11	13.75%
Total	**80**	**100%**

E.coli was 100% resistant to aztrenam and gentamycin, *Klebsilla* was 100% resistant to imipenum, Aztreonam and gentamycin, *Pseudomas aerugnosa* was 100% resistant to imipenem, Polymixin-B, Pipracillin/ Tazobactum, Aztrenam and gentamycin (Table 2).

Table 2: Antibiotics resistance pattern shown by gram negative bacterial isolates from blood sample.

Gram negative organism antibiotics	Number and percentage of resistance cases		
	***E. coli* (n=22)**	***Klebsiella* (n=14)**	***Pseudomonas* (n=11)**
Meropenem (ME)	16 (72.7)	8 (57.1)	7 (63.6)
Imepenem (IM)	16 (72.7)	14 (100)	11 (100)
Colistin (CL)	11 (50)	9 (64.2)	2 (18.1)
Polymixin-B (PB)	18 (81.8)	10 (71.4)	11 (100)
Piperacillin/Tazobactum (Pt)	19 (86.3)	13 (92.8)	11 (100)
Amikacin (AK)	20 (90.9)	12 (85.7)	1 (9.09)
Netilmicin (Nt)	20 (90.9)	13 (92.8)	3 (27.2)
Azteronam (AT)	22 (100)	14 (100)	11 (100)
Gentamycin (G)	22 (100)	14 (100)	11 (100)

Table 3: Antibiotics resistance pattern shown by gram positive bacterial isolate from blood sample.

Gram positive organism antibiotics	Number and percentage of resistance cases		
	S.aureus (n=17)	***CoNS*** (n=6)	***Enterococci*** (n=11)
Vancomycin (VA)	10 (58.8)	3 (50)	8 (72.7)
Teicoplanin (TEI)	9 (52.9)	3 (50)	8 (72.7)
Linezolid (LZ)	9 (52.9)	3 (50)	5 (45.4)
Amikacin (AK	17 (100)	6 (100)	11 (100)
Netlimicin (Nt)	17 (100)	6 (100)	11 (100)
Cefoxitin (CX)	17 (100)	6 (100)	11 (100)
Erythromycin (ERT)	17 (100)	6 (100)	11 (100)
Gentamycin (G)	17 (100)	6 (100)	11 (100)
Polymixin-B (PB)	17 (100)	1 (100)	11 (100)

S.aureous was 100% resistant to Amikacin, Netilmicin, Cefoxitn, Erythromycin, Gentamycin and Polymixin-B, CoNS was 100% resistant to Amikacin, Netilmicin, Cefoxitin, Erythromycin, Gentamycin, *Enterococci* was 100% resistant to Amikacin, Netilmicin, Cefoxitin, Erythrmycin, gentamycin and Polymixim-B (Table 3).

DISCUSSION

Neonatal septicaemia is one of the major causes of mortality and morbidity. Septicaemia usually consists of bacteraemia plus a constellation of signs and symptoms caused by the microorganisms or their toxic products in the circulation. The usual source of infection include incubators, resuscitators, ventilators, solution for could sterilization, feeding bottles, catheters, face masks, and infusion set and sites etc.[6] Sepsis is a significance cause of death in the newborn, particularly among those of very low birth weight and premature infants.

The world health Organization (WHO) estimate that worldwide 1.6 million newborn baby die every year from neonatal infections. Despite recent advances in neonatal intensive care and current strategies to treat neonatal sepsis, mortality rates have not fallen for over three decades except in babies born to mothers who have received intrapatum prophylaxis (IAP) for group B streptococcus.[7]

The total blood culture positivity rate among neonates with sepsis in this study group was 66.67%, which was comparable to the study by Higher culture positivity rates of 25.6%, 28.3%, 48%, 62.8% and 64% among neonates with sepsis had been reported. In this study the gram negative rods were the main cause of septicaemia.[8-12]

Identified as *E.coli* 22 (27.50%), *Klebsiella pneumonia* 14(17.50%), *Pseudomonas* 10 (12.50%), this is approximately same as Rao Pooja et al says that *Klebsiella spp*. (15.5%), in another study isolation rate of *K. pneumonia, S. aureus, E. coli* were 22.41%, 18.37%, 6.12% respectively.[6,20] Emergence of antimicrobial resistance in GNB poses major therapeutic challenge. Many studies have shown resistance to third-generation cephalosporins, aminoglycosides, and carbapenems in recent years.[13-19,21]

In the present study, GNB were highly resistance to Azteronam (AT) (100%), Gentamycin (G) (100%).The most common causes of death in the neonatal period are infections, including septicaemia, meningitis, respiratory infections, diarrhoea, and neonatal tetanus (32%), followed by birth asphyxia and injuries (29%), and prematurity (24%).

The data available are a mixture of official sources and hospital and community based studies. In developing countries, the rate of home deliveries is high, and the percentage of deliveries assisted by a skilled attendant is low: in Africa it ranges from 37% in sub-Saharan Africa to 69% in North Africa, in Asia from 29% in South Asia to 66% in East Asia and the Pacific region. In South America and the Caribbean, it is about 83%.[2]

CONCLUSION

To conclude, in our study, the blood culture positivity rate was 66.67%. Gram negative organisms were predominant. *E.coli* 22 (27.50%), was the most common isolate.

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