

Bacteriological profile and sensitivity pattern of neonatal sepsis

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Abstract

Introduction : Neonatal sepsis remains an important cause of neonatal morbidity and mortality in NICU setup and a major challenge for the neonatologists. The prevalent organisms and their antibiotic resistance patterns evolve with time and with the usage of antimicrobials.

Aims and Objectives : To analyze the bacteriological profile and antibiotic resistance patterns of proven neonatal sepsis cases in Dhaka Shishu Hospital.

Materials and Methods : The study was Prospective observational study. All the clinically suspected cases of Neonatal Sepsis admitted to the Neonatal ward from January 2015 to December 2015 were included in the study. Clinically suspected cases of neonatal sepsis further evaluated with blood cultures and antibiotic susceptibility testing using the Kirby Bauer disc diffusion method. Data was collected for the following variables: Demographic profile, haematological profile, blood culture result and antibiotic sensitivity patterns.

Results : Total 96 cases clinically suspected neonatal sepsis were included in the study. Among them 29 cases (30.21%) was culture positive septicemia. *Klebsiella pneumoniae* was the most common isolate accounting for 31.03% cases followed by *Escherichia coli* 27.59%. In *Klebsiella* infection most common sensitivity were Imipenem and Ciprofloxacin which were 77.78 and 33.33% respectively. In *E.coli* common sensitive drugs were Imipenem and Amikacin. In *Serratia* common sensitive drugs were Imipenem, Netilmicin and Ciprofloxacin.

Conclusion : *K. pneumoniae* was the most common pathogen. Most common sensitivity was Imipenem, Amikacin, Ciprofloxacin, Gentamicin, Netilmicin, and Ceftazidime,.

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Introduction

Neonatal sepsis is defined as systemic inflammatory response syndrome caused by suspected or proven infection occurring within the first 28 days of life.¹ Neonatal septicemia is responsible for approximately 25% of the neonatal deaths in the world and mostly in developing countries.^{2,3} Increased prevalence of extended spectrum beta-lactamases (ESBLs) and methicillin-resistant *Staphylococcus aureus* (MRSA) and multiple drug resistant (MDR) strains is a cause of concern in Neonatal Intensive Care Units (NICU) worldwide. Septicemia has been classified as early onset septicemia (EOS) and late-onset septicemia

(LOS).⁴ The microorganisms most common associated with EOS include Group B *Streptococcus* (GBS), *Escherichia coli*, coagulase negative *Staphylococcus species* (CONS), *Haemophilus influenzae* and *Listeria monocytogenes*.⁵ and LOS is caused by CONS, *S.aureus*, *E.coli*, *Klebsiella spp.*, *Pseudomonas spp.*, *Enterobacter spp.*, *Candida spp.*, GBS, *Serratia spp.*, *Acinetobacter spp.* and anaerobes. The recent trends show an increase in infections due to CONS.⁶

The clinical diagnosis of neonatal septicemia is difficult as it presents with non-specific signs and symptoms. An early diagnosis of neonatal septicemia is

important to initiate appropriate and prompt treatment. The correct and timely identification of infectious agents and their antibiotic sensitivity patterns are essential to guide the clinicians regarding both the empirical and definitive treatment.⁷ In this study we analyzed the bacteriological profile in neonatal septicemia and their antibiotic sensitivity pattern.

Material and methods

This was a prospective observational study conducted in the Department of Neonatology, Dhaka Shishu (Children) Hospital. All the clinically suspected cases of Neonatal Sepsis admitted to the Neonatal ward from January 2015 to December 2015 were included in the study. Neonatal sepsis was clinically suspected if a neonate presented with the clinical signs and symptoms of Neonatal sepsis and with positive history of high risk factors in mother such as-

- Chorioamnionitis
- prolonged rupture of membrane > 24 hours
- meconium stained or foul smelling liquor during labour
- presence of urinary tract infection, more than 3 or unclean vaginal examination during labour
- those babies who needed active resuscitation at the time of birth.

Total 96 cases clinically suspected neonatal sepsis were included in the study. Blood cultures were taken in all the clinically suspected cases. Empirical antibiotic therapy was started in all the cases. Demographic profile (age, sex and birth weight), haematological parameters etc. were properly recorded and tabulated in chart. The Blood samples were collected from peripheral vein using strict aseptic precautions. Sampling site was cleansed with 70 % alcohol and 1% povidone iodine followed by alcohol. 2 ml of blood was collected in a single blood culture bottle (20 ml of brain heart infusion broth with 0.025 % sodium polyethanol sulfonate as anticoagulant) and sent for microbiological examination. The Samples were incubated at 37°C for 7 days. Subcultures were done on blood agar, Mac Conkey and Chocolate medium on appearance of turbidity on days 1, 2, 3 and 7. Organisms were identified according to the standard microbial procedures including gram stain, colony morphology, motility and biochemical reactions. Antimicrobial susceptibility testing was done

using Kirby Bauer disc diffusion method on Mueller Hinton agar as per CLSI guidelines.

Results

Total 96 cases clinically suspected neonatal sepsis were included in the study. The mean age was 8.33±7.36 days, mean birth weight was 2816.25±288.6 gm, male were predominant which was 68.75% (Table I).

Table I: Demographic characteristics of the study population

Parameters	Mean±SD	Range
Age (days)	8.33±7.36	1-20
Weight (gm)	2816.25±288.6	1500-3420
Sex	No.	Percentage
● Male	66	68.75%
● Female	30	31.25%

In this study out of 96 cases 29 cases were culture positive septicemia which was 30.21% (Table II).

Table II: Blood culture findings

Blood culture	Number	Percentage
Culture positive	29	30.21
Culture negative	67	69.79
Total	96	100.00

In this series *Klebsiella* was the commonest isolate, accounting for about 31% of neonatal septicaemia. The second commonest isolate was *E.coli*, which was seen in 27.59% of cases. The *Serratia*, *Acinetobacter* and *Pseudomonas* isolates were also seen in about 24%, 10.34% and 6.90% of cases respectively (Table III).

Table III: Isolated organism of culture positive cases (n=29)

Organism	Number	Percentage
<i>Klebsiella pneumoniae</i>	09	31.03
<i>Escherichia coli</i>	08	27.59
<i>Serratia</i>	07	24.14
<i>Acinetobacter</i>	03	10.34
<i>Pseudomonas</i>	02	6.90

In *E.coli* common sensitive drugs were Imipenem, Amikacin, Ciprofloxacin, Netilmicin, Ampicillin and Gentamicin which were 100%, 75%, 62.5%, 50%, respectively. In *Klebsiella* most common sensitivity were Imipenem and Ciprofloxacin which were 77.78% and 33.33% respectively. In *Acinetobacter* common sensitivity were Amikacin, Gentamicin, Ceftazidime, Imipenem and Netilmicin which were 100.0%, 66.67, 66.67, 66.67 and 66.7% respectively. In *serratia* common sensitive drugs were Imipenem, Netilmicin and Ciprofloxacin which were 100.0%, 57.14 and

42.86% respectively. *Pseudomonas* was found 50.0% sensitive to Ceftazidime, Amikacin, Ciprofloxacin, Imipenem, Netilmicin and Ceftriaxone (Table IV).

Table IV: Sensitivity pattern of blood culture positive organism

Organism	<i>E.coli</i>	<i>Klebsiella</i>	<i>Acintobacter</i>	<i>Serratia</i>	<i>Pseudomonas</i>
Total=29 blood culture positive	n=8 (%)	n=9 (%)	n=3 (%)	n=7 (%)	n=2 (%)
Ampicillin	03 37.5	00 0.00	00 0.00	00 0.00	00 0.00
Gentamicin	03 37.5	02 22.22	02 66.67	00 0.00	00 0.00
Ceftazidime	02 25	02 22.22	02 66.67	00 0.00	01 50
Amikacin	06 75	02 22.22	03 100.0	00 0.00	01 50
Ciprofloxacin	05 62.5	03 33.33	01 33.33	03 42.86	01 50
Imipenem	08 100	07 77.78	02 66.67	07 100	01 50
Netilmicin	04 50	02 22.22	02 66.67	04 57.14	01 50
Cotrimaxazole	02 25	02 22.22	01 33.33	00 0.00	00 0.00
Ceftriaxone	02 25	02 22.22	01 33.33	00 0.00	01 50

Discussion

Neonatal septicaemia is one of the leading causes of neonatal mortality in developing countries like Bangladesh and India. The bacteriological profile of neonatal sepsis varies from place to place and from time to time.⁸

In this study, about 30.21% cases with suspected neonatal septicemia had positive blood culture. A review showed that, positive culture ranged from 8 % to 73 % in the diagnosis of potential sepsis.^{9,10} Our result is almost similar to the study of Haque et al, Mathur M et al and comparable to Mondol JP et al.^{11,12}

In this series *Klebsiella* was the commonest isolate, accounting for about 31% of neonatal septicaemia. The second commonest isolate was *E.coli*, which was 27.59%. The *Serratia*, *Acintobacter* and *Pseudomonas* isolates were also seen in about 24%, 10.34% and 6.90% of cases respectively. Comparable with the study of Singh et al, they found *Klebsiella pneumoniae* was the most common isolate accounting for 49.64% cases followed by *Escherichia coli* 26.95%, *Pseudomonas aeruginosa* 7.80%, and *Staphylococcus aureus* 7.09%, same as the results of earlier studies.¹³⁻¹⁵ In the study of Kumaravel et al. showed that among the isolates, *Klebsiella* was the most common organism followed by *Escherichia* and *Pseudomonas*.⁸ Many other studies have also reported *Klebsiella* as the most common isolate.¹⁶ The National Neonatal Perinatal database also states *Klebsiella* as the most common (29%) pathogen in neonatal septicaemia.¹⁷

The other studies done by Aletayeb et al, Shrestha et al, and Jyothi et al. showed that *K. pneumoniae*, *S.aureus*

and coagulase negative *Staphylococci* were the predominant organisms for neonatal sepsis.^{15, 18, 19}

Bhat et al found that *S. aureus* was the predominant organism for neonatal sepsis.²⁰ Mhada et al Shahian et al. and Dias et al reported coagulase-negative *Streptococci* as the major organisms for neonatal sepsis in their studies.^{21,22}

In our study *E.coli* had sensitivity to Imipenem, Amikacin, Ciprofloxacin and Netilmicin, which were 100%, 75%, 62.5%, 50% respectively. In *Klebsiella* most common sensitivity were Imipenem and Ciprofloxacin which were 77.78% and 33.33% respectively. In *Acinatobacter* common sensitivity were Amikacin, Gentamicin, Ceftazidime, Imipenem and Netilmicin which were 100.0%, 66.67, 66.67, 66.67 and 66.7% respectively. *Serratia* was sensitive to Imipenem, Netilmicin and Ciprofloxacin which were 100.0%, 57.14 and 42.86% respectively. In *Pseudomonas* 50.0% sensitivity was found in Ceftazidime, Amikacin, Ciprofloxacin, Imipenem, Netilmicin and Ceftriaxone. *Klebsiella* was sensitive to ciprofloxacin shown in the studies done by Kayange et al and Aletayeb et al.^{15,23}

In this study most of the strains showed a low sensitivity to Amikacin (14.94%), Gentamicin (14.29%) and Cefotaxime (4.55%). When compared with the other studies Cefotaxime was found less sensitive in our study.^{18,19,21} Study done by Singh et al showed that *S. aureus* was highly resistant to Ampicillin (80 %) which was similar to the results of some other studies.^{14,24} In this study varying levels of resistance was also found against Co-trimoxazole (60%) and 3rd generation Cephalosporins (10%).

Conclusion

K. pneumoniae was the most common pathogen of Neonatal septicaemia. Most common sensitivity found to Imipenem, Amikacin, Ciprofloxacin and Netimicin.

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