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Nisar Ahmad Bhat
PG Scholar, Department of Pediatrics and Neonatology, SKIMS, Srinagar, Jammu & Kashmir, India

Irshad Ahmad Bhat
PG Scholar, Department of Pediatrics and Neonatology, SKIMS, Srinagar, Jammu & Kashmir, India

Roma Verma
PG Scholar, Department of Pediatrics and Neonatology, SKIMS, Srinagar, Jammu & Kashmir, India

Wajid Ali
Professor and HOD, Department of Neonatology, SKIMS, Srinagar, Jammu & Kashmir, India

Corresponding Author:
Roma Verma
PG Scholar, Department of Pediatrics and Neonatology, SKIMS, Srinagar, Jammu & Kashmir, India

Clinical and bacteriological profile of neonatal sepsis: A study in SKIMS hospital Srinagar

Nisar Ahmad Bhat, Irshad Ahmad Bhat, Roma Verma and Wajid Ali

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Abstract
Background: Neonatal sepsis is one of the leading causes of neonatal morbidity and mortality. Despite implementing of different preventive interventions, the burden of neonatal sepsis is reporting in different areas of Srinagar. The objective of the study was undertaken to determine the pattern of bacterial isolates and Correlation of Time of onset and blood culture.
Study Design: This prospective study was conducted in Neonatology unit of department of pediatrics SKIMS, Srinagar. Study was conducted on 100 patient including preterm and term both.
Results: Although gold standard for diagnosing neonatal sepsis is blood culture, the yield culture positivity is low making it difficult to diagnose neonatal sepsis. In our study blood culture was positive in 27% patients. Among culture positive babies Acinetobacter was the most common organism grown in 6(22.22%). In our study Sensitivity of TLC in detecting sepsis was found to be 40.74%.
Conclusion: Acinobacter was the most common organism grown, followed by *E.Coli*, *Klebsiella*, CONS and pseudomonas.

Keywords: Neonatal sepsis, bacteriological, blood culture

Introduction
Neonatal sepsis remains the most serious problem in neonatal intensive care and results in significant morbidity and mortality, particularly in very low birth weight (VLBW) preterm infants. The clinical presentations of neonatal sepsis are nonspecific. This includes symptoms like fever, respiratory distress, lethargy/irritability, convulsions, bulging fontanels, refusal to feed, jaundice, bleeding, abdominal distension, and temperature dysregulation [1]. Maternal risk factors like premature rupture of membranes (PROM), chorioamnionitis, peripartum fever, urinary tract infection within 2 weeks prior to delivery and prolonged rupture of membranes > 18 hours, multiple gestations, and caesarean sections are associated with increased risk of EOS. LOS occurs as a result of postnatal nosocomial infections or community-acquired infections. The risk factors associated with LOS are prematurity, prolonged invasive interventions like mechanical ventilation and intravascular catheterization, failure of early enteral feeding with breast milk, long duration of parenteral nutrition, hospitalization, surgery, and underlying respiratory and cardiovascular diseases [2, 3].
Here, we evaluated the causative pathogen, incidence, clinical course and mortality rate of neonatal sepsis.

Materials & Method
In the present study a total of 100 neonates meeting the inclusion criteria were enrolled. Specimen of blood were taken from each neonate before commencement of antibiotics for sepsis work up which will included CBC including ANC, IT ratio, bacterial culture, CSF analysis, CXR (when indicated), PCT & CRP.

Blood cultue: Blood was collected from non-punctured vein under strict asepsis. The blood samples were inoculated into BacT/ALERT PF blood culture bottles immediately which contain 20 mL peptone-enriched TSB, supplemented with BHI solids and activated charcoal & examined using the BacT/Alert 3D automated blood culture system (bioMerieux), which monitors blood cultures with a colorimetric CO_2 sensor, which is internally attached to the bottom of the blood culture bottles. Positive cultures are recognized by a computer-driven algorithm, which monitors both initial and increased concentrations of CO_2 [92].

The bottles were then incubated for a period of five days. After five days, the positive bottles were removed from the instrument, and subcultured on blood agar & McConkey's agar. The subcultures were incubated for 24h a t 37º C. Microorganisms which had grown on the culture media were then identified with the Vitek 32 (bioMerieux) system for species identification & antimicrobial drug sensitivity of organism.

Other hematological test

Total count, absolute neutrophil count and IT ratio were calculated as per standard hematological methods. The following are considered as abnormal laboratory parameters:

- Total leukocyte <5000/cmm or >20,000/cmm.
- Absolute neutrophil count Low counts as per Manroe chartfor term and Mouzinho's chart for VLBW infants
- Immature/total neutrophil >0.2.

Results

This prospective study was conducted in Neonatology unit of department of pediatrics SKIMS, Srinagar with following results:

Table 1: Distribution according to type of sepsis

S. No.	Type of Sepsis	No. of Baby	Percentage
1	EOS	62	62%
2	LOS	38	38%
	Total	100	100%

Out of 100 neonates included in the study 62 (62%) had Early Onset Sepsis (EOS) i.e onset within 72 hours of life and 38 (38%) had Late Onset Sepsis (LOS) i.e onset within 72 hours of life.

Table 2: Distribution according to Gestational age

	EOS	LOS	Total	P value
Preterm	38	18	56	0.173
Term	24	20	44	
Total	62	38	100	

In our study 56% cases were preterm (<37weeks) and 44% were term (> 37 weeks).Out of 62 babies with EOS 38 were preterm and 24 were term whereas out of 38 babies LOS 18 were preterm and 20 were term, p value being statistically insignificant (with 0.173).

Table 3: Distribution of blood culture

S. No.	Growth	No. of Baby
1	Present	27
2	Absent	73
	Total	100

Out of 100 neonates blood culture was positive in 27 (27%) patients and negative in 73 (73%) patients.

Table 16: Distribution of type of organism grown in blood culture

S. No.	Types of organism	No. of Baby	Percentage
1	*Acinetobacter*	6	22.22%
2	*E. coli*	5	18.51%
3	*Klebsiella pneumonia*	4	14.81%
4	CONS	3	11.11%
5	*Pseudomonas*	2	7.40%
6	*Sphingomonas paucimobilis*	2	7.40%
7	*Klebsiella oxytoca*	2	7.40%
8	*Staphylococcus Aureus*	1	3.70%
9	*E.Coli + Klebsiella*	1	3.70%
10	Candida	1	3.70%

Among culture positive babies Acinetobacter was the most common organism grown in 6(22.22%) cases, followed by *E.Coli* in 5 (18.51%), *Klebsiella* in 4 (14.81%), CONS in 39 (11.11%), pseudomonas in 2 (7.40%), *Sphingomonas paucimobilis* in 2 (7.40%), *Klebsiella* oxytoca in 2(7.40 %), Staphylococcus aureus in 1 (3.70 %), *E.Coli + Klebsiella* in 1(3.70%), Candida in 1(3.70%) cases.

Discussion

Neonatal sepsis is one of the most important cause of morbidity and mortality in newborns throughout the world .Early detection of neonatal sepsis is difficult because the first signs of disease may be minimal and are often non-specific being similar to those of various non infectious processes [4], Further, blood culture results are not usually available until at least 48- 72 hours resulting in unnecessary and delayed treatment [5]. Several leucocyte indices and acute phase reactants have been evaluated for the diagnosis of sepsis [6]. However, to date, no single laboratory test has provided rapid and reliable identification of infected neonates. To avoid unnecessary treatment of uninfected neonates an early, senisitive and specific test is needed. This has led to a search for new diagnostic markers [7, 8].

In our study 56% cases were preterm (<37weeks) and 44% were term (> 37 weeks). This was comparable with Raghavan *et al.* [9] in which 68% cases were with gestational age <37weeks.The higher incidence of sepsis in preterm babies is due to the inherent compromised immunity, low complement levels and hypogammaglobulinemia in these neonates [10].

Although gold standard for diagnosing neonatal sepsis is blood culture, the yield culture positivity is low making it difficult to diagnose neonatal sepsis. In our study blood culture was positive in 27% patients only which was closer to Nowshad *et al.* [11] in which culture positive cases were 30%. Out of these 14(51.5%) cases were having EOS and 13 were having LOS(48.44%) and the difference was stastically insignificant (p value. 204), males were

15(55.55%) and females were 12 (44.44 %) and the difference was stastically insignificant (p value 0. 670), preterm were 17 (63%) and term were 10% (37%) with stastically insignificant p value of 0.274, 20 cases were < 2.5 kg and 7 cases were > 2.5 kg with p value of 0.062 which is stastically insignificant.

Among culture positive babies Acinetobacter was the most common organism grown in 6(22.22%) cases which was close to Suchitlingam *et al.* [12] which incidence of 35% cases, followed by *E.Coli* in 5 (18.51%), *Klebsiella* in 4 (14.81%), CONS in 39 (11.11%), pseudomonas in 2 (7.40%), *Sphingomonas paucimobilis* in 2 (7.40%), *Klebsiella* oxytoca in 2(7.40 %), Staphyloccus aureus in 1 (3.70 %), *E.Coli*+ *Klebsiella* in 1 (3.70%), candida in 1(3.70%) cases.

In our study Sensitivity of TLC in detecting sepsis was found to be 40.74%, specificity 83.56%, positive predictive value (PPV) 47.83% and Negative predictive value (NPV) 79.22% which is comparable to Khalada *et al.* [13] which reported TLC sensitivity of 50% and specificity of 91%, PPV 43% and NPV 93% in their study. *Gerdes JS* [125] in his study reported that sensitivity and specificity of leucopenia to be 26% and 91% respectively in diagnosis septicemia. Sensitivity of IT ratio in detecting sepsis was found to be 29.63%, specificity 94.52%, positive predictive value (PPV) 66.67% and Negative predictive value (NPV) 78.41 %.

Conclusion

In our study we found that Acinobacter was the most common organism grown, followed by *E.Coli*, *Klebsiella*, CONS, pseudomonas. Out of 100 neonates blood culture was positive in 27 (27%) patients and negative in 73 (73%) patients. In our study 56% cases were preterm (<37weeks) and 44% were term (> 37 weeks). The higher incidence of sepsis in preterm babies is due to the inherent compromised immunity, low complement levels. There was no correlation found between Gestational age and blood culture.

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