

Original Research Article

Clinical and etiological profile of neonatal sepsis in children admitted to tertiary care hospital

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ABSTRACT

Background: Neonatal sepsis is leading cause of mortality in children. The clinical presentation of neonatal sepsis is non-specific and variable. This study was undertaken to study clinical and etiological profile of neonatal sepsis.

Methods: This was a prospective study conducted over a period of one year from March 2018 to March 2019. The patients with clinically suspected sepsis were included in this study. Detailed history and examination was done in all patients. In addition to baseline investigations, C-reactive protein and blood culture was done in all patients. Blood culture was done prior to administration of antibiotics.

Results: In this study there were total of 102 patients out of which 54 were male and 48 were female. Among 102 patients, 69 patients were premature born before 37 weeks of gestation. Prematurity emerged to be the most common risk factor. In this study 62% patients had EOS (<72 hours of life) and 38% had LOS (>72 hours of life). The most common presenting feature were refusal of feeds, lethargy, respiratory distress and hypothermia. Other features were seizures, abdominal distension, apnea and sclerema. Blood culture was positive in 41% patients. The most common organism isolated on culture was *Klebsella* followed by *E. coli*.

Conclusions: Neonatal sepsis is leading cause of mortality in children. Early diagnosis and treatment is of paramount importance to prevent mortality. The clinical presentation of neonatal sepsis is non-specific and variable. So, high index of suspicion is required to detect sepsis at earliest. Gram negative organism like *Klebsella* and *E. coli* are the common causative organism in neonatal sepsis.

Keywords: Early onset sepsis, Late onset sepsis, Neonatal sepsis

INTRODUCTION

Neonatal sepsis is defined as a disseminated disease with positive blood culture during the first month of life, and encompasses various systemic infections of the newborn such as septicemia, meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infection.¹ It is more common in developing countries compared to developed countries.² Neonatal Sepsis is the commonest cause of neonatal mortality and it is responsible for 30-50% of the

total neonatal deaths in developing countries.^{3,4} It is estimated that 20% of neonates develop sepsis and approximately 1% death related to sepsis.² Some of the factors responsible for sepsis in newborns are immaturity of the immune system, which include decreased phagocyte activity of white cells, decreased production of cytokines and weak cellular and humoral immunity. Moreover, the natural skin barrier is very thin. Various other maternal, fetal and environmental factors also contribute towards sepsis in the newborns. Some of the

maternal factors are premature rupture of membrane, maternal fever within 2 weeks prior to delivery, meconium stained amniotic fluid (MSAF), foul smelling liquor and instrumental delivery. The fetal factors include birth weight, gestational age and APGAR score.^{5,6} Depending on the onset of symptoms, it can be classified into early onset sepsis within 72 h of life and late onset sepsis usually after 72 h of age.⁷ Early signs of sepsis are frequently non-specific and subtle. It has been one of the major diagnostic problems for physicians due to the non-specificity of its symptoms and the absence of a reliable paraclinical marker. Furthermore, the gold standard for detection of blood culture is unreliable when intrapartum antibiotics have been administered.^{8,9} The spectrum of organisms that cause neonatal septicemia varies in different countries, and sometimes changes from one centre to another within the same country.¹⁰ Group B streptococci (GBS) and *E. coli* predominate in the USA and Europe, whereas Staphylococci and Gram-negative bacilli are much more common in developing countries.¹¹

Aim of this study was to the clinical and etiological profile of neonatal sepsis.

METHODS

This was a prospective study conducted in department of pediatrics and neonatology at Government Medical College Srinagar, Kashmir over a period of one year from March 2018 to March 2019 after obtaining ethical clearance from ethical committee of GMC Srinagar. Prior consent was taken from parents.

Inclusion criteria

All neonates both term and preterm with clinical features suggestive of neonatal sepsis were included in study.

Exclusion criteria

- Patients with history of antibiotic administration prior to admission were excluded from study.
- Patients with apparent congenital malformations were excluded from study.

The important clinical features suggestive of neonatal sepsis include refusal of feeds, lethargy, respiratory distress, hypothermia, seizures, apnea, abdominal distension, sclerema, jaundice and bleeding. Detailed history was taken from parents and subsequently thorough examination was done. Baseline investigations were done in all patients. In addition to this, C-reactive protein and blood culture was done in all patients. The sample for bacterial culture was immediately inoculated into the Bact/Alert PF plus culture bottles. These culture bottles were loaded into the instruments after scanning the bar code of the bottle and incubated in Bact/Alert Microbial detection system. In this study two automated systems namely BacT/Alert system and Vitek 2 compact were used for early detection of organisms.

RESULTS

In this study there were total of 102 patients out of which 54 were male and 48 were female with a male to female ratio of approximately 1.1 :1. Out of these 102 patients, 69 were born before 37 weeks of gestation and rest 33 patients were born after 37 weeks of gestation as depicted in Table 1.

Table 1: Gestational age.

Gestational age	No of patients	Percentage
<37 weeks	69	67.64%
>37 weeks	33	32.36%

Among 102 patients, 60 patients were low birth weight with a birth weight of less than 2.5 kilogram and rest 42 patients had birth weight more than 2.5 kilogram as depicted in Table 2.

Table 2: Birth weight.

Birth weight	No. of patients	Percentage
<2.5kg	60	58.80%
>2.5kg	42	41.20%

Prematurity was most common risk factor followed by low birth weight. Other risk factors were meconium stained liquor and per vaginal leaking as depicted in Table 3.

Table 3: Risk factors.

Risk factor	No. of patients	Percentage
Prematurity	69	67.64%
Low birth weight	60	58.82%
Meconium stained liquor	18	17.6%
Per vaginal leaking	9s	8.8%

Out of 102 patients, 63 (62%) patients presented before 72 hours of life and were labelled as early onset sepsis (EOS) and 39 (38%) patients presented after 72 hours of life and were labelled as late onset sepsis (LOS). The most common presenting features was refusal of feeds (82%) followed by lethargy (61%) and respiratory distress (46%). Other features were hypothermia (24%), abdominal distension (9%), seizures (16%), apnea (11%) and sclerema (5%) as depicted in Table 4.

Blood culture revealed growth in 42 patients yielding a culture positivity rate of 41%. The most common organism isolated was *Kleibsell* followed by *Escherchia coli* and *Methicillin* resistant *Staphylococcus aureus* (MRSA). Other organism isolated were coagulase negative *Staphylococcus aureus* (CONS), *Acintebacter* and *Pseudomonas*. Among 42 culture positive patients, 26 (62%) patients had EOS and 16 (38%) patients had

LOS. *Kleibsell*a was the most common organism in both EOS (early onset sepsis) and LOS (late onset sepsis). Whereas *Escherchia coli* was the second most common organism in EOS and CONS in LOS as depicted in Table 5.

Table 4: Clinical features.

Clinical feature	No. of patients	Percentage
Poor Feeding	84	82%
Lethargy	63	61%
Respiratory distress	47	46%
Hypothermia	25	24%
Seizures	17	16%
Apnea	12	11%
Abdominal distension	10	9%
Sclerema	5	5%

Table 5: Blood culture in EOS and LOS.

Organism	No. of patients in EOS	No. of patients in LOS	Total percentage
<i>Kleibsell</i> a	12	6	17.64%
<i>E. coli</i>	8	2	9.80%
MRSA	5	1	5.88%
CONS	0	5	4.90%
<i>Acintebacter</i>	1	1	1.96%
<i>Pseudomonas</i>	0	1	0.98%
Total	26	16	41%

DISCUSSION

In this study there were total of 102 patients, out of which 54 were male and 48 were female with a male to female ratio of 1.1:1 revealing almost equal incidence in males and females. In studies by Galhotra et al, Tallur et al and Aletayeb et al there was male preponderance in contrast to this study.¹²⁻¹⁴ Prematurity was most common risk factor in this study similar to study by Galhotra et al, Aletayeb et al, Bhat et al and Chacko et al.^{12,14-16} In this study majority of patients had EOS. 62% had EOS and 38% had LOS. This is similar to study done by Galhotra et al, Jain et al and Vinod et al.^{12,17,18} Refusal of feeds was most common presentation.

It was seen in 82% patients. Sathyamurthi et al, reported refusal of feeds in 78% patients.¹⁹ Whereas Begum S et al, reported in 50% patients and Galhotra et al reported only in 15% patients.^{12,20} Lethargy was the second most common clinical presentation and was seen in 61% patients which is in contrast to study by Galhotra et al, where lethargy was seen in 15% patients only.¹² Respiratory distress was seen in 46% patients which is similar to study by Begum S et al and Sathyamurthi et al where respiratory distress was seen in 40% and 56% respectively.^{19,20} Jain et al and Awaisu et al, also reported respiratory distress as one of the common clinical feature.^{17,21} Hypothermia was seen in 24% patients.

Sathyamurthi et al, reported hypothermia in 35 % patients.¹⁹ Whereas Galhotra et al, reported hypothermia in 95% patients.¹² Seizures were seen in 16% patients. Begum S et al reported seizures in 20% patients.²⁰ Whereas Sathyamurthi et al and Galhotra et al, reported in 7% and 5% respectively.^{12,19} Apnea was seen in 11% patients. Begum S et al, reported apnea in 24% patients.²⁰ Abdominal distension and sclerema were seen in 9% and 5% respectively. Begum S et al, reported abdominal distension and sclerema in 33% and 9% respectively.²⁰ Blood culture was positive in 41% patients. Ahmed et al reported culture positivity in 35% patients.²² Galhotra et al and Martin et al, reported culture positivity in 7% and 9.5% respectively.^{12,23} The higher culture positivity could be attributed to the fact that blood culture was drawn prior to administration of antibiotics. Bhattacharjee et al and Tallur et al reported culture positivity in 48% and 64% respectively.^{13,24} *Kleibsell*a was the most common organism isolated on culture. Similar findings were reported by Aletayeb et al, Ghotaslou et al and Sundaram et al.^{14,25,26} *E. Coli* was the second most common organism isolated. Ahmed et al, reported *E. Coli* as most common organism isolated on culture.²²

CONCLUSION

Neonatal sepsis is leading cause of mortality in children. Early diagnosis and treatment is of paramount importance to prevent mortality. The clinical presentation of neonatal sepsis is non-specific, so high index of clinical suspicion is required. The most common presenting features of neonatal sepsis are refusal of feeds, lethargy, respiratory distress and hypothermia. Gram negative organisms like *Kleibsell*a and *E. coli* are leading causes of neonatal sepsis. Blood culture yield can be increased by drawing sample prior to administration of antibiotics.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of GMC Srinagar, India

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