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Original Research Article

Clinical features and bacteriological profile of late onset sepsis

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ABSTRACT

Background: Neonatal sepsis is one of the major causes of morbidity and mortality in the neonatal period. Late onset sepsis (LOS) is associated with community environment or postnatal exposure to hospital environment. It's incidence is rising due to greater survival of preterm neonates and very low birth weight babies. The bacterial isolates of neonatal sepsis especially that in LOS are changing. An understanding of the changing epidemiology of neonatal LOS will help to reduce the associated mortality and morbidity. The objective was to study the clinical symptoms and signs of late onset sepsis, to study the bacteriological profile of LOS.
Methods: A prospective observational study. All neonates presenting with signs and symptoms of sepsis after 72 hours of life up to day 28 were included. Babies with birth asphyxia and congenital anomalies were excluded from the study.
Results: A total of 120 newborns with LOS were included in the study. Of this 42.5% had blood culture positive sepsis. Lethargy, refusal of feeds and apnoea were seen in 61.66%, 55.0% and 34.17% of babies respectively. *Klebsiella* (25.49%), *Staphylococcus aureus* (23.53%) and coagulase negative *Staphylococcus* (21.57%) were the predominant organisms isolated in LOS.
Conclusions: Prompt diagnosis of neonatal sepsis is a challenge. The incidence of LOS in neonates is rising. Klebsiella is the most common gram negative organism; *Staphylococcus aureus* and CONS are the predominant gram positive organisms. CONS is emerging as an important causative organism in LOS..

Keywords: Blood culture, Bacterial etiology, Neonatal sepsis

INTRODUCTION

The commonest cause of neonatal mortality is sepsis, accounting for about 30-50% of neonatal deaths in developing countries. The incidence of neonatal sepsis is estimated to be 20% and approximately 1% die due to sepsis related causes.[1] Data from national neonatal and perinatal database (NNPD) 2002-2003 showed incidence of neonatal sepsis to be 30 per 1000 live births.[2] Neonatal sepsis can be divided into early onset sepsis (EOS, occurring within 72 hours of birth) and late onset sepsis (LOS, occurring after 72 hours of birth). Typically the source of infection in EOS is maternally acquired usually from the maternal genital tract. LOS is usually acquired from either hospital settings (nosocomial) or community acquired. Neonates can present with pneumonia or meningitis or septicaemia. Low birth weight, prematurity, NICU care, ventilation and invasive procedures predispose to nosocomial LOS; risk factors for community acquired LOS are poor hygiene& cord care, bottle feeding etc. The clinical features of neonatal sepsis being non-specific, a high index of suspicion are needed for diagnosis. A practically applicable sepsis screen has been described.[3-5]

A reduction in EOS has generally been observed in epidemiological studies, probably due to improvements in obstetric care and greater use of intrapartum antibiotics. Improved survival of preterm and very low birth weight babies with modern NICU care and prolonged hospitalisation have resulted in increasing incidence of LOS, which varies from 0.61% o 14.2% among hospitalised neonates. The pattern of pathogens in LOS should be re-evaluated regularly as it changes over time and regions.[6-8] Prompt recognition and appropriate treatment of LOS is a challenge due to non-specific presentation. This study was done to identify the common signs and symptoms and bacterial isolates in LOS.

METHODS

This was a prospective observational study conducted in a tertiary level NICU in rural Bangalore over a period of five months. All neonates presenting with signs and symptoms of sepsis after 72 hours of life upto day 28 were included. Babies with birth asphyxia and congenital anomalies were excluded from the study. Informed consent was obtained from parents of the neonates in the study. Detailed maternal, birth, postnatal histories were recorded in a pre-set proforma. The following signs were looked for in the neonates: lethargy, refusal of feeds, respiratory distress (>60/ min), grunt, vomiting, abdominal distension, jaundice, apnoea, seizures, central cyanosis, bradycardia (HR <100/min), tachycardia (HR>160/min), hypothermia (rectal temperature <36°C), hyperthermia (rectal temperature>37.5°C), sclerema. All neonates underwent sepsis screen testing that included total leucocyte count, absolute neutrophil count, Immature to total ratio, serum CRP, micro ESR. blood culture and sensitivity was done in all neonates under aseptic precautions as per standard protocol. The neonates were categorised as (a) proven sepsis- blood culture positive and clinical signs and symptoms of sepsis, (b) Probable sepsis- clinical signs and symptoms of sepsis with two or more parameters of sepsis screen positive and no growth in blood culture. All neonates were stabilised and managed as per standard NICU protocols. Data was analysed using descriptive analytical tools.

RESULTS

120 neonates with signs and symptoms of sepsis after 72 hours of life were included in the study. There were 42 term and 78 preterm neonates with a mean gestational age of 32.2±3.1 weeks. There were 87 low birth weight babies (72.5%) in the study. 51 neonates in the study i.e 42.5% had blood culture positive and were categorised as Proven sepsis. 69 neonates i.e 57.5% were sepsis screen positive but blood culture negative and categorised as probable sepsis. 47.44% and 33.33% of preterm and term neonates had proven sepsis respectively. The characteristics of the neonates are given in Table 1.

Table 1: Study population.

	n (%)	Males, n (%)	Females, n (%)	Proven sepsis, n (%)	Probable sepsis, n (%)
Preterm	78 (65.0)	53 (67.95)	25 (32.05)	37 (47.44)	41 (52.56)
Term	42 (35.0)	29 (69.04)	13 (31.71)	14 (33.33)	28 (66.67)

Table 2: Clinical features in neonates with LOS.

Clinical features	n (% of babies)	Proven sepsis n (%)	Probable sepsis n (%)
Lethargy	74 (61.66)	40 (54.05)	34 (45.95)
Refusal of feeds	66 (55.0)	42 (63.64)	24 (36.36)
Apnoea	41 (34.17)	26 (63.41)	15 (36.59)
Respiratory distress	26 (21.67)	16 (61.54)	10 (38.46)
Jaundice	22 (18.33)	14 (63.63)	8 (36.36)
Vomiting	20 (16.67)	8 (40.0)	12 (60.0)
Tachycardia	15 (12.5)	8 (53.33)	7 (46.66)
Abdominal distension	14 (11.66)	5 (35.72)	9 (64.28)
Seizures	12 (10.0)	8 (66.67)	4 (33.33)
Grunt	10 (8.33)	6 (60.0)	4 (40.0)
Hyperthermia	10 (8.33)	7 (70.0)	3 (30.0)
Hypothermia	8 (6.66)	5 (62.5)	3 (37.5)
Bradycardia	5 (4.16)	3 (60.0)	2 (40.0)
Central cyanosis	4 (3.33)	3 (75.0)	1 (25.0)
Sclerema	1 (0.83)	1 (100.0)	0 (0)

The clinical signs and symptoms seen in the neonates with LOS are shown in Table 2. The most common symptoms seen were lethargy and refusal of feeds in 61.66% and 55.9% respectively, followed by apnoea and respiratory distress in 34.17% and 21.67% respectively. Lethargy, refusal of feeds, apnoea, grunt, respiratory distress and seizures were more common in neonates with proven sepsis than in those with probable sepsis; vomiting and abdominal distension were seen to a greater extent in probable sepsis group than in proven sepsis group.

Table 3: Bacteria isolated in proven sepsis.

Organisms	n (%)
Klebsiella	13 (25.49)
Staphylococcus aureus	12 (23.53)
CONS	11 (21.57)
E. coli	8 (15.68)
Pseudomonas aeruginosa	3 (5.88)
Enterobacter spp	2 (3.92)
Acinetobacter	2 (3.92)

The causative organisms isolated from blood in neonates with LOS are shown in Table 3. Klebsiella was the most common organism(25.49%), followed by Staphylococcus aureus and coagulase negative Staphylococcus isolated in 23.53% and 21.57% respectively. 28(23.33%) neonates died, 13 (10.83%) were discharged against medical advice and 79 neonates (65.83%) were discharged.

DISCUSSION

Neonatal sepsis remains a dreaded cause of neonatal mortality and morbidity. The blood culture positivity in LOS in the present study was 42.5%, while 57.5% had probable sepsis. Roy et al had a blood culture positivity of 47.5% in their study.[9] In other Indian studies, the blood culture yield has ranged from as low as 25% to as high as 64.87% in neonates with sepsis.[10,11] Among hospitalised neonates, an incidence of LOS varying between 0.4% to 14.2% has been reported.[8] Tallur et al in their study of neonatal sepsis reported that 16.5% had late onset sepsis.[11]

In the present study, lethargy, refusal of feeds and apnoea were the predominant symptoms noted among neonates with LOS. Kar SS et al in their study in 2013 found apnoea as the most common followed by lethargy and tachycardia in neonates with LOS.[12] Cardiorespiratory signs and jaundice were the most frequent clinical features reported by Tallur SS et al.[11] The signs and symptoms of sepsis are non-specific and demand a high degree of suspicion for early diagnosis.[3]

The commonest organism causing LOS in the present study was *Klebsiella* followed by *Staphylococcus aureus* and coagulase negative *Staphylococcus*. Waters et al in their review of the etiology of community acquired neonatal sepsis in low and middle income countries found Klebsiella to be highly prevalent in South-East Asia. In developing countries, they found potential similarities in major causative organisms between hospital-acquired and community acquired neonatal sepsis.[13] Tallur et al reported also reported *Klebsiella* species as the most common organism in their study.[11] Vishwanathan R et al in their study in a rural NICU set up, reported 46.3% blood culture positivity with predominant gram negative isolates, *Klebsiella* being the most common organism followed by *E coli.* They also noted that profile of organisms causing early and late onset sepsis was similar in their study.[14]

In 2012, Hammoud MS et al in Kuwait reported CONS as the most common causative organism in 35.7% of LOS; Klebsiella was the most common gram negative organism in 18.8% of LOS.[15] Tsai MH et al reported that rates of LOS were inversely proportional to birth weight and gestational age. Increased risk of mortality and morbidity was associated with Pseudomonas and Candida SPP in LOS.[16] CONS account for 35.5% - 47.4% of LOS in some developing nations and a higher percentage in industrial countries. CONS is emerging as the most common causative organism in LOS. As the pattern of isolates in LOS changes over time and regions, this should be regularly re-evaluated to guide management.[8]

CONCLUSION

The clinical features of neonatal sepsis being non specific, pose a great challenge for prompt diagnosis. Lethargy, refusal of feeds and apnoea were the most common clinical features in LOS in this study. *Klebsiella* was the predominant gram negative organism and *Staphylococcus aureus* and CONS were the predominant gram positive isolates from blood culture in LOS. The incidence of LOS is increasing world-wide with CONS as the predominant pathogen. The pattern of pathogen isolates in LOS needs to be analysed and reviewed regularly to guide management.

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