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Original Research Article

Epidemiological and clinicobacteriological study of neonatal sepsis

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ABSTRACT

Background: Neonatal mortality is still high in developing countries like India, which is mostly contributed by sepsis. Early diagnosis and appropriate management can improve the outcome of neonatal sepsis. Diagnosis of neonatal sepsis can be difficult at times as the symptoms and signs are nonspecific. To study the incidence of sepsis in different gestational age and birth weight categories.
Methods: The study conducted prospectively in1169 babies admitted to NICU from first May 2011 to 30th April 2012. Data was collected using performance. Investigations including CBC, CXR, Blood culture sensitivity and CRP were done on the same day (IT ratio and micro ESR were not done). CSF study and cultures of urine, surface swab, tracheal aspirate etc done only in selected cases.
Results: There were 238 episodes of sepsis and the incidence of sepsis in this study was 20.01% among the babies admitted during the study period. The incidence was more in extreme preterm and extremely low birth weight categories. Among babies with sepsis culture positive sepsis was seen in 18.45%. *E. coli* was the commonest organism in EOS and Klebsiella in LOS.
Conclusions: In this study incidence of neonatal sepsis was 20.35%. Lower the birth weight and gestational age, higher was the incidence of sepsis. PROM >18 hours, MSAF and prematurity were found to be associated with EOS while extreme prematurity, prolonged ventilation, indwelling catheters and prolonged hospital stay were found to be statistically significant in causing LOS.

Keywords: *E. coli*, Low birth weight, Neonatal sepsis, Pneumonia

INTRODUCTION

Neonatal period is considered the most important age group at all times as newborns are most vulnerable to disease and death. Historically the probability of death during neonatal period was so high that many traditional practices were postponed until after the first week of life, ensuring the probability of child's survival.[1] Also, the quality of life and health as the child grows into adult life is partly determined at this stage. Many avoidable handicaps during childhood like cerebral palsy, mental subnormality and recurrent seizures have their origin in perinatal period.[2] Septicemia is a major cause of mortality and morbidity in the neonatal period. The incidence of neonatal sepsis according to the National neonatal-perinatal database (NNPD) 2002 data is 32 per 1000 live births in tertiary care institutions.[3] The bacteriological profile of neonatal sepsis is constantly under change, more so with advances in early diagnosis, treatment and increased survival of preterm babies. So, any protocol for sepsis management must be based on the antimicrobial sensitivity, which needs to be reviewed from time to time.[4] Also, sepsis if identified and treated appropriately in time it has a very good outcome. There are many studies on bacteriological profile in Western countries, but only a few in Indian set up. This study was done to

know the current incidence of sepsis among the babies admitted to NICU, the pattern of the etiological agent in neonatal sepsis and the antibiotic sensitivity profile of the microorganisms isolated.[5]

METHODS

A prospective study 169 in neonates aged 2 months to 5 years conducted at Department of Paediatrics, Sri Muthu Kumaran Medical College Study conducted prospectively in babies admitted to NICU from first May 2015 to 30th April 2016. Those with signs of sepsis or with risk factors for sepsis were identified and included in the study.

Data was collected using performance. Investigations including CBC, CXR, Blood culture sensitivity and CRP were done on the same day (IT ratio and micro ESR were not done). CSF study and cultures of urine, surface swab, tracheal aspirate etc done only in selected cases.

The components of sepsis screening in this study are TLC <5000 or >20000, ANC based on Monroe's and Mouzino's charts, CRP >1mg/dl and thrombocytopenia <100000. Newborn with any clinical features of sepsis with culture negativity, but having two or more positive tests in sepsis screen, or with radiological evidence of pneumonia.

Neonate is considered to have additional episode of sepsis, if another organism is cultured from a subsequent culture or if the infant meets the criteria for probable sepsis again after 10 days of appropriate antibiotic therapy with a definite symptom-free interval of one week. Babies with confirmed sepsis or probable sepsis were followed up, to study the outcome. A good outcome is one in which the subject recovered completely from sepsis. Any baby who lost follow up as in case of discharge against medical advice is considered dead.

Statistical analysis

Data were analyzed using SPSS. A statistical test was done using a Chi-squared test. Where the numbers in a cell was less than five a Fisher's exact test was used. A p value of <0.05 was considered statistically significant.

RESULTS

There were 1169 admissions during the 1 year study period. Among them 908 were inborn and 261 were outborn.502 babies who underwent septic screen were identified and enrolled in the study, in whom 236 babies were diagnosed to have sepsis and the total number of episodes of sepsis were 238 (20.35%).

Among the 238 babies with sepsis 168 (70.58%) had EOS and 70 (29.42%) had LOS.11 babies who went discharge against medical advice within 48 hours were not included in the analysis.

Table 1: Sepsis in inborn versus outborn.

	Inborn	outborn	
Total admission	100	69	
Episodes sepsis	37 (23.08%)	29 (26.69%)	P
EOS	24 (08.9%)	10 (6.3%)	0.036
LOS	39 (22.1%)	30 (33.7%)	

The incidence of sepsis is statistically high in outborn babies among the those who required NICU admission with p-value of 0.036. In both inborn and outborn groups incidence of EOS was more than the incidence of LOS.

Table 2: Sepsis in different birth weight categories.

	No. of sepsis	No. of babies	Percentage
<1000 g	15	20	11.0
1000-1499	60	94	78.38
1500-2499	95	35	31.42
>2500	68	20	12.95

Lower the birth weight higher the incidence of sepsis. P value <0.001.75% of babies with extremely low birth weight developed sepsis, whereas sepsis in normal weight babies was only 12.95%.

Table 3: Risk factors for early onset sepsis (n=169).

Variable	No.	P value	Odds ratio
Maternal fever	16	0.423	-
PROM	100	0.03	1.03
MSAF	15	0.04	1.22
Extreme low weight	11	0.001	2.71
asphyxia	27	0.15	-

Table 4: Pattern of the etiological agent in early and late onset sepsis.

Organism	EOS	LOS
CONS	5	5
E. coli	2	3
Enterobacter	-	1
GNB	-	1
Klebsiella	6	6
Salmonella	1	-
MRSA	-	2
NFGNB	2	3
Aeromonas	1	-
Staph. aureus	-	1
Strep. pneumoniae	-	1
Candida albicans	-	2
Candida nonalbicans	-	2

The risk factors evaluated as the cause of EOS were peripartum maternal fever, PROM >18 hours, MSAF, prematurity, low birth weight and birth asphyxia. In this study, no significant association was found in causing

EOS by peripartum maternal fever (p 0.413) or birth asphyxia (p 0.15), whereas PROM >18 hours and MSAF are found to be related (p 0.05, 0.04).

Klebsiella was the predominant pathogen causing both EOS and LOS in this study. Fungal sepsis noted only with LOS. 46.54% of patients with culture-positive sepsis died compared to 12.22% in the culture-negative group with p-value 0.,000. Sepsis with gram-negative sepsis got higher mortality compared to gram-positive sepsis.

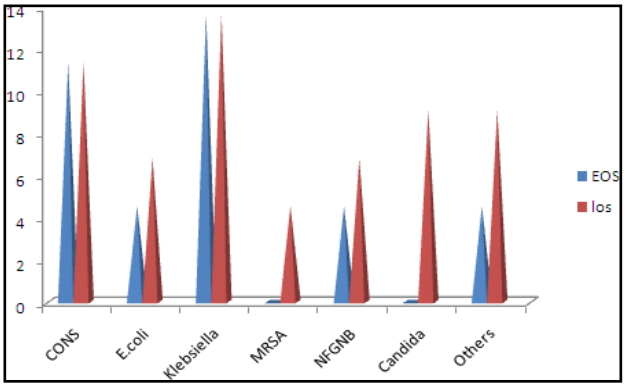

Figure 1: Bacteriological profile of neonatal sepsis.

Both EOS and LOS had predominant gram-negative septicemia. EOS had 29.42% gram-positive and 70.58% gram-negative isolates. LOS had 70.58% gram-positive and 60.87% gram-negative organism.

DISCUSSION

The incidence of sepsis was found to have a strong association with birth weight and gestational age. 75% of babies with weight <1000 gm had developed sepsis, while it was only 12.95% in birth weight group of >2500.All babies <28 weeks had developed sepsis during a hospital stay, while it was only 13.45% in babies more than 38weeks.The most common clinical presentation was respiratory distress (80%), followed by CNS symptoms of seizure poor feeding and letharginess.[6] In babies with shock rate of mortality was high (p 0.001). This was comparable to the study conducted by Hill H R et .al, while in another study conducted at Hubli Jaundice was the most common presentation.[7] Among the risk factors evaluated for EOS PROM >18 hours, MSAF, prematurity and low birth weight were found to be statistically significant with p-value 0.03, 0.04 and0.001 respectively whereas intrapartum maternal fever and asphyxia were not predictive of EOS in this study.[8] In case of LOS prolonged ventilation, indwelling central line and associated surgical problems (PUV, NEC, PDA, CDH) were found to have statistically significant with p values 0.000,0.02 and 0.008 respectively.[9] A study done Monroe et al et.al found a statistically significant association between EOS with Meconium liquor and multiple vaginal examinations. In the same study could not Among the babies with sepsis 44 had culture positive sepsis (18.48%), which was much less compared to the existing reports, where it was 54.4% according to NNPD.[10] This could be due to prior antibiotic therapy and or lack of improvised microbiological techniques. In this study, the predominant organism both in EOS and LOS was Klebsiella, which was different from the existing reports.[11] The most common organism of EOS in western countries is GBS. One of the studies from south India reported *E. coli* as the most common organism of EOS and Klebsiella in LOS. Emerging drug resistance is a concern on the basis of this study.[12] Only 41.66% of the CONS isolate was sensitive to cephalosporins, which is the first line antibiotic in this nursery.[13] 54.54% of the Klebsiella were multidrug resistant and among the Staphylococcal isolates 66.66% were methicillin resistant. Also, 60% of the NFGNB 60% are resistant to all tested antibiotics. All the resistant organisms were isolated from babies with LOS.[14] The mortality due to sepsis in this study was 11.55 which is less compared to NNPD data where it is 19%. Extreme low birth weight and culture positive sepsis were the best predictors of mortality in neonatal sepsis.[15]

CONCLUSION

Neonatal sepsis is still common in our setting and continues to be a major cause of neonatal mortality. In this study incidence of neonatal sepsis was 20.35%. Lower the birth weight and gestational age, higher was the incidence of sepsis. The number of culture-positive sepsis was 18.48% among the babies with sepsis. Culture positive sepsis had a higher positive predictive value for mortality in neonatal sepsis.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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