International Journal of Contemporary Pediatrics
Reddy KV et al. Int J Contemp Pediatr. 2017 Jul;4(4):1259-1262
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20172519

Original Research Article

Clinico-bacteriological profile of neonatal sepsis in rural tertiary care hospital

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Received: 16 May 2017
Accepted: 20 May 2017

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ABSTRACT

Background: Neonatal sepsis one of the most common cause for neonatal mortality and morbidity in developing countries. Group B Streptococci being the most common organism in developed countries, whereas CONS and Gram negative bacteria frequently encountered organisms in developing countries. It is advisable to have an individualised institutional protocol based on their own culture reports to reduce the antibiotic resistance.
Methods: A prospective observational study was conducted from September 2016- February 2017, at the Department of Paediatrics, S.V.S. Medical College and Hospital, Mahabubnagar, Telangana, India. The study included 65 neonates admitted in our NICU. A questionnaire was filled by mothers after taking consent. Data was Collected data was analysed.
Results: In our study, we found that CONS were the most commonly isolated organisms followed by *Klebsiella*.
Conclusions: Neonatal sepsis creates a significant burden due to its impact on neonatal mortality and long-term morbidity. Following proper hand washing techniques with minimal handling in intensive care units will reduce neonatal sepsis from opportunistic infections.

Keywords: Antibiotics, Culture positive, Neonatal sepsis

INTRODUCTION

Every year, about 2.8 million children die in the first month of life with 98% of these deaths occurring in developing countries. Neonatal infections including sepsis and meningitis are estimated to cause over 420,000 deaths each year with 136,000 attributed to pneumonia.[1]

According to recent data from National Neonatal Perinatal Database (NNPD) 2000, the incidence of neonatal sepsis has been reported to be 38 per 1000 intramural live births in tertiary care institutions.[2]

The chances of survival are slim for a new-born with a serious infection whether hospitalized or in a community. The identification and treatment of a new-borns with infection is weak in many developing country settings.[3] Neonatal diseases are difficult to diagnose clinically because signs and symptoms are much more non-specific for infectious syndromes (sepsis. Pneumonia or meningitis) than in older children. The same clinical signs can be present, for example, in neonates born preterm (<37 weeks gestation). With intra-partum complications, or viral illness, with or without concurrent bacterial infection.[4]

In developed countries, clinical diagnosis of severe bacterial infection in neonates is supported by experienced Paediatricians and systematic laboratory investigation, including conventional microbiological (blood, cerebrospinal fluid and urine), haematological, and biochemical tests. Microbiological identification of a

pathogen isolated from blood cultures can confirm a clinical diagnosis of neonatal sepsis and has high specificity. Although sensitivity has been improved with automated blood couture systems, it is still likely less than 80% particularly with small (<1ml) blood volumes, common from neonatal samples and if the colony forming unit is low (<4 CFU/ml).[4]

Neonatal sepsis can be divided into two main subtypes depending whether the onset is during the first 72 hours of life i.e., early onset sepsis (EOS), or later i.e., late onset sepsis (LOS). Clinical signs and symptoms vary from decreased sucking, lethargic, inactivity, pale "just not looking right", hypothermia. High index of suspicion may be necessary.[5]

Bacteria responsible for neonatal sepsis varies from place to place and also from time to time. Antibiotics have been used extensively in the management of sepsis. On many occasions, antibiotics have been used empirically without identifying the causative organisms or knowing the antibiotic sensitivity, leading to development of resistance. It is therefore necessary to note which are the common organisms causing sepsis in our area and their sensitivity to antibiotics. This will help us to use appropriate antibiotics and reduce the development of antibiotic resistance.

Hence we have taken up the study in SVS medical college hospital which is a tertiary care centre and very frequently have new-born referrals from other surrounding areas.

METHODS

This study was conducted in the NICU of SVS Medical college hospital during September 2016- February 2017. It's a hospital based, prospective, analytical study. All babies admitted in Neonatal Intensive Care unit with the clinical suspicion of sepsis during the study period were included in the study. Babies who were already on antibiotics, with congenital anomalies and whose birth weight was less than 1500 grams were excluded. Informed written consent was taken from either of the parents of the babies who were included in the study.

In all cases investigations like complete blood picture, total leukocyte count, Platelet count, C-reactive protein, blood sugar, serum calcium, blood culture and sensitivity, CSF examination, X-ray chest, complete urine examination, urine culture and sensitivity, tracheal aspirate for Gram stain and culture, swab cultures when indicated were collected. Neurosono scan and MRI were performed selectively.

Complete blood picture, platelet count was done by the automated cell counter method. CRP was done by using serum and it is qualitative and semi quantitative latex agglutination kit. X-ray chest was done in cases presenting with respiratory distress. Blood sugar were monitored in all cases.

Blood culture was done in all cases. Urine culture and CSF culture were done whenever indicated Blood was collected with all aseptic precautions. Sterile gloves were worn to collect the sample. Using 70% alcohol, the skin over the venipuncture site was cleansed in a circle of 5cm diameter. Allowed to air-dry. Starting in the centre of the circle, 2% tincture of iodine was applied in widening circles from the centre to the periphery. It was air dried for a minute. Needle was introduced into the peripheral vein and blood was drawn, After the needle was removed, site was cleaned with 70% alcohol. 1 ml of blood was drawn. Blood for culture was inoculated into culture bottle containing 5ml of Brain Heart infusion broth and incubated at 37 Celsius for 24 hours. Subcultures were done o blood agar and MacConkey agar on days 1,4,7 if bottles did not show turbidity. Isolates are identified by their characteristic appearance on their respective media and gram staining and confirmed by the pattern of biochemical reactions using the standard method.

RESULTS

Total number of cases admitted during the study period were 309. Out of this 174 were intramural i.e., born in our hospital and 135 were extramural i.e., referred from different peripheral hospitals.

75 (24.27%) new-borns were diagnosed to have sepsis with 34 (45.33%) from intramural and 41 (54.67%) from extramural. 49 (65.33%) of them were males and the rest i.e., 26 (34.67%) were females. There were 58 (77.33%) preterm babies 17 (22.67%)were term babies. 51(68%) of them were small for gestational age and 24 (32%) were appropriate for gestational age. 37 (49.33%) had early onset sepsis and 38 (50.67%) had late onset sepsis.

Table 1: Socio demographic Profile of Participants.

Characters of infants	%
Intramural	34 (45.33%)
Extramural	41 (54.67%)
Males	49 (65.33%)
Females	26 (34.67%)
Preterm	58 (77.33%)
Term	17 (22.67%)
SGA	51 (68%)
AGA	24 (32%)
EOS	37 (49.33%)
LOS	38 (50.67%)
Culture +ve in EOS	14 (37.83%)
Culture +ve in LOS	4 (10.53%)

Out of 37 cases of early onset sepsis 14 (37.83%) were culture positive and only 4 (10.53%) of 38 cases of late

onset sepsis were shown culture positivity. The demographic profile was shown in Table 1.

The signs and symptoms of babies with clinical sepsis and their distribution of patients based on clinical signs and symptoms was shown in Table 2. Distribution of cases based on haematological investigations was shown below in Table 3.

Table 2: The signs and symptoms of babies with clinical sepsis and their distribution.

Clinical signs and symptoms	No. of cases
Poor activity/ poor feeding	54 (72%)
Respiratory distress	8 (10.67%)
Convulsions	6 (8%)
Fever	3 (4%)
Vomiting	2 (2.67%)
Jaundice	1 (1.33%)
Abdominal distension	1 (1.33%)

Table 3: Distribution of cases based on haematological investigations.

Investigation	No. of babies	%
C-reactive protein >6 mg/dl	60	80 %
Abnormal total leukocyte count	30	40%
<5000/cu mm	19	25%
>15000/ cu mm	11	15%
Platelet count <100000/dl	22	30%

In a total of 75 cases of sepsis 18 (24%) had culture positive with 14 (77.78%) in early onset sepsis and 4 (22.22%)in late onset sepsis. In EOS 7 (50%)cases grown Gram positive bacteria and remaining 7 (50%) were shown Gram negative bacteria in the blood. Out of 4 cases of LOS 1 was positive for gram positive organism in blood and 3 were shown growth of Gram negative organism with 2 in blood and 1 in urine. Drug sensitive pattern for specific bacteria was shown in Table 4.

Table 4: Sensitivity pattern

Type of Bacteria	Sensitivity pattern
CONS	Amoxiclav, Clindamycin, Levofloxacin, Linezolid, Amikacin, Erythromycin, Vancomycin.
Enterobacter	Vancomycin, Linezolid, Teicoplanin.
Acinetobacter	Cotrimoxazole, Ciprofloxacin, Doxycycline, Tigecycline
Klebsiella	Ceftazidime, Cotrimoxazole, Ceftriaxone, Levofloxacin, Piperacillin-Tazobactam, Imipenem, Tigecycline.
Pseudomonas	Amikacin, Ciprofloxacin, Cefepime, Imipenem, Polymyxin-B
Citrobactor	Amoxiclav, Amikacin, Cotrimoxazole

DISCUSSION

The present study was done over a period of 6 months as a pilot study. Out of 309 cases admitted during this time 75 (24.27%) were with clinical sepsis. 18 (24%) were proven positive culture.

We observed more number of males with sepsis with male to female ratio of 1.88:1 and this is nearer to the observation of Srinivas S, Avuncular D in KIMS Bangalore where it was 1.3:1.[6]

Contrary to the observation made by Jyothi, Basavaraj where EOS was more we noticed EOS (49.33%) and LOS (50.67%) with equal prevalence in our study. They had 74.8% of EOS and 25.2% of LOS. This may be due to their large sample size.[7] But this finding is similar to that of S Thakur and K Thakur.[8] There were 77.33% pre-term and 22.67% terms in our study with 68% SGA and 32% AGA babies. This was comparable to the study of D E Premalatha and M Koppad.[9] These two were predominant risk factors. This was shown in many other studies too. It may be due to underdeveloped immunity and associated maternal risk factors and decreased barrier function of immature skin and mucus membranes.

72% were presented with poor activity/ poor cry followed by 10.67% with respiratory distress, 8% with convulsions in the present study. Whereas 52% of neonates presented with respiratory distress in the study of Shresta S and Singh DS.[10]

C reactive protein was positive in 80% of clinical sepsis cases and was similar to the observation of Basu et al in their study where it was positive in 79.83% cases.[11] Whereas Shresta et al noticed positive CRP only in 15% of cases.[10] Abnormal TLC was shown in 40% of cases in the present study and was not comparable to Basu et al or Shresta et al who showed a higher % of abnormal TLC.[10,11] Similarly, thrombocytopenia was noticed in 30% of cases but not comparable to the observations of Shresta et al where it was much low.[10] This wide difference in the haematological findings could possibly be due to the difference in performing the test. In the present study of 75 cases with clinically suspected sepsis 24% cases were proved to be culture positive. This was in

consistence with the observation of Mehar, Yadav S study where culture positivity rate was 22.1%. Culture positivity for aerobic organisms was 25-60 % in various Indian studies.[8,10,11] But much low in other studies about 19.2% in Srinivas D, Arunkumar D study.[6] However, negative blood culture does not rule out sepsis. Inadequate blood volume collection may be one reason for poor positivity although required blood volume was not exactly specified in children. Out of 18 culture positive cases 77.78% (13) were in EOS and 22-22% (4) were in LOS in the present study. 50% of cultures shown the growth of CONS and Staphylococci and remaining 50% cases had growth of gram negative bacteria Acinetobacter, Enterobacter and E. coli. Whereas in Los Gram negative bacteria like *klebsiella, Pseudomonas, Citrobactor* were grown in 75% cases with CONS in 25% of cases.

Gram positive bacilli predominate over gram negative organisms in the present study with CONS the most frequent isolate followed by *Kleibsella* which is in agreement with the observation of Srinivas D, Arunkumar D where as in Mehar, Yadav study gram negative bacilli predominated.[11] As a district hospital, there were many infants referred from rural areas which might have influenced the outcome.[12] Zakariya, Bhat et al also showed *Kleibsella* as the most common isolate.[13]

All CONS isolates were sensitive to Clindamycin, Linezolid, Vancomycin, levofloxacin but resistant to Cephalosporin. This is in consistent with the observation of R Anegundi, Raghavendra.[14] Gram negative organisms Kleibsella and Acinetobacter showed sensitivity to Tigecycline, Doxycycline and cotrimoxazole but resistant to Imipenem and is similar to the study of R Anegudi et al.[14] Antibiotic resistance in the present study was quiet high against to commonly used drugs like, Ampicillin and Cephalosporin's. As the present study showed resistance to Imipenem in case of Gram negative isolates its unnecessary use should be discouraged. The importance of hand washing should be stressed in all the Primary care centres. Nursing staff, mothers and the attendants should be sensitized in this regard.

CONCLUSION

Neonatal sepsis creates a significant burden due to its impact on neonatal mortality and long-term morbidity. Due to lack of ideal diagnostic tools, neonatal sepsis still remains a major cause for neonatal mortality especially in developing countries. Following proper hand washing techniques with minimal handling in intensive care units will reduce neonatal sepsis from opportunistic infections.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Reddy KV, Sailaja K, Ashok A, Poojitha K. Clinico-bacteriological profile of neonatal sepsis in rural tertiary care hospital. Int J Contemp Pediatr 2017;4:1259-62.