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NEONATAL SEPSIS AND BACTERIOLOGICAL IDENTIFICATION OF ORGANISMS FROM BLOOD CULTURE

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Conflicts of Interest: Nil

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Abstract:

INTRODUCTION: Neonatal sepsis is a common and significant health care problem. World Health Organization has shown that 1.6 million deaths occur globally every year due to neonatal infections and 40% of all neonatal deaths occur in developing countries. The signs and symptoms of neonatal sepsis are fever or hypothermia, respiratory distress including cyanosis and apnea, feeding difficulties, lethargy or irritability, hypotonia, seizures, bulging fontanel, poor perfusion, bleeding problems, abdominal distention, hepatomegaly, gauiac-positive stools, unexplained jaundice. Very little information is available on these infections and deaths due to sub-optimal public health surveillance systems and lack of transportation to appropriate health facilities where social tabbos, culture, diagnostic tools, and antimicrobial susceptibility testing may be available. In the context of the worldwide threat of antimicrobial resistance (AMR), India's condition is considered starker than any other place. **MATERIAL AND METHODS:** All inborn babies were screened for sepsis. Clinical sepsis was suspected if the neonate had symptoms and signs suggestive of sepsis like poor feeding, poor activity, respiratory distress, apnea, seizure, lethargy, bulging anterior fontanel, fever, hypothermia, jaundice, vomiting, loose stools, abdominal distension, cyanosis, bleeding, mottling, tachycardia, weak pulse, grunting, retractions, nasal flaring. C - reactive protein and micro erythrocyte sedimentation rate were done in all these cases. Blood culture was sent to microbiology department for confirmation of the diagnosis. The isolates were identified based on standard techniques. **RESULTS**: A total of 110 cases of suspected sepsis were enrolled in the study. Mean birth weight was 2.14 kg ±0.45. Out of 110 cases 61(55.5%) were male and 49(44.5%) were female. Of the 110 clinically suspected cases of neonatal sepsis, 59 (53.6%) were early-onset and 51 (46.4%) were late-onset sepsis. In 34 (30.9%) early-onset cases the blood-culture was positive, while in only 7 (6.4%) late-onset sepsis cases a pathogen was isolated from blood culture (P value 0.001). total 41 (37.3%) were culture positive. 23 isolates were Klebsiella pneumonia isolates of which 18 (43.9%) were from early onset and 5 (12.2%) were late onset. **CONCLUSION:** Blood culture positivity was 37.3%. klebsiella pneumonia was the commonest organism isolated. Proper management should be done to decrease the rate of incidence of sepsis by Klebsiella.

Keywords: *Escherichia coli, AMR, GBS and Meconium stained liquor.*

Introduction

Neonatal sepsis is a common and significant health care fact, especially in very-low-birth-weight infants (VLBW <1500 g). Neonatal sepsis is also a major cause of morbidity worldwide and one of the three primary causes of 2.7 million deaths every year.[i]World Health Organization has shown that 1.6 million deaths occur globally every year due to neonatal infections and 40% of all neonatal deaths occur in developing countries[ii].In some cases antibiotic prophylaxis to

mother has decreased the incidence of early-onset group B streptococcal infection, it still remains a major cause of neonatal sepsis. Some studies have shown that among VLBW preterm infants there is an increase in early-onset sepsis caused by *Escherichia coli*[iii], [iv].

The signs and symptoms of neonatal sepsis are fever or hypothermia, respiratory distress including cyanosis and apnoea, feeding difficulties, lethargy or irritability, hypotonia, seizures, bulging fontanel, poor perfusion, bleeding problems, abdominal distention, hepatomegaly, guaiac-positive stools, unexplained jaundice[v]. *Streptococcus pneumonia* and group A streptococci were the major causes of neonatal sepsis from 1933 to 1943 and from the late 1940s to the 1960s, Gram-negative bacilli, especially *Escherichia coli* (*E. coli*), were the most common causes of neonatal sepsis[vi]. Late onset sepsis is mainly associated with the organisms acquired from the environment after birth. Of the 6.9 million neonatal sepsis burden, South Asia accounts for 3.5 million cases per year and India claims a large proportion of this disease burden[vii]. Very little information is available on these infections and deaths due to sub-optimal public health surveillance systems and lack of transportation to appropriate health facilities where social taboos, culture, diagnostic tools, and antimicrobial susceptibility testing may be available. In the context of the worldwide threat of antimicrobial resistance (AMR), India's condition is considered starker than any other place[viii].

Presently in India no data are available on timing of neonatal infections, types of infections (bacterial, viral, other), AMR, and precise time of deaths of Indian neonates in the community setting.The bacterial agents associated in early-onset sepsis include group B Streptococcus (GBS), Escherichia coli, coagulase-negative Staphylococcus, Haemophilus influenzae and Listeria monocytogenes and the organisms commonly associated with late-onset sepsis include coagulase-negative staphylococci (CONS), Staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli, Enterobacter spp., Pseudomonas aeruginosa and Acinetobacter species[ix], [x].

MATERIAL AND METHODS

This prospective cohort study was conducted in the division of paediatrics Dept. of Paediatrics Chandulal Chandrakar Memorial Medical College, Kachandur, Durg. During this period all inborn babies were screened for sepsis. Clinical sepsis was suspected if the neonate had symptoms and signs suggestive of sepsis like poor feeding, poor activity, respiratory distress, apnoea, seizure, lethargy, bulging anterior fontanel, fever, hypothermia, jaundice, vomiting, loose stools, abdominal distension, cyanosis, bleeding, mottling, tachycardia, weak pulse, grunting, retractions, nasal flaring. Primary test like C-reactive protein, and micro erythrocyte sedimentation rate were done in all these cases. Detailed mothers past and present history was taken. Risk factors for sepsis were noted such as ventilator support, CPAP, central line and exchange transfusion prior to the onset of sepsis. Blood culture was sent to microbiology department for confirmation of the diagnosis. The isolates were identified based on standard techniques. The drug susceptibility of the clinical isolates to some routinely used antibiotics was determined by the Kirby-Bauer disk diffusion method

OBSERVATIONS AND RESULTS

During the study period a total of 110 cases of suspected sepsis were enrolled in the study. Of the total 110 cases 38 (34.5%) were preterm babies. Mean birth weight was 2.14 kg ±0.45. Out of 110 cases 61(55.5%) were male and 49(44.5%) were female. Meconium stained liquor was observed in 21(19.1%). Spontaneous vaginal delivery was in 84(76.4%)

Table 1: Neonatal characteristics

characteristics	Value n=110
Preterm neonates (%)	38(34.5%)
Birth weight (Kg), mean ± SD	2.14±0.45
Male	61(55.5%)
Female	49(44.5%)
Meconium stained liquor (%)	21(19.1%)
Spontaneous vaginal delivery	84(76.4%)
Caesarean section (%)	26(23.6%)

Of the 110 clinically suspected cases of neonatal sepsis, 59 (53.6%) were early-onset and 51 (46.4%) were late-onset sepsis. In 34 (30.9%) early-onset cases the blood-culture was positive, while in only 7 (6.4%) late-onset sepsis cases a pathogen was isolated from blood culture (P value 0.001). total 41 (37.3%) were culture positive.

Table 2: Organisms isolated

Organisms	Early onset sepsis	Late onset sepsis
Klebsiella pneumoniae	18 (43.9%)	5 (12.2%)
Escherichia coli	2 (4.9%)	
Acinetobacter spp	2 (4.9%)	
Pseudomonas	3(7.3%)	
Coagulase negative Streptococci	4 (9.8%)	1(2.4%)
Group B Streptococcus	2 (4.9%)	
Streptococcus pneumoniae	2(4.9%)	1(2.4%)
Listeria monocytogenes	1 (2.4%)	
Total	34 (82.9%)	7 (17.1%)

Of the total 41 isolates. 23 were Klebsiella pneumonia isolates of which 18 (43.9%) were from early onset and 5 (12.2%) were late onset. 2 Escherichia coli were isolated from early onset sepsis cases. 2 Acinetobacter sp., 3 Pseudomonas aeruginosa,4 CONS, 2 Group B Streptococcus and 1 Listeria monocytogenes was isolated from early onset sepsis cases. One isolate each from late onset sepsis cases were Coagulase negative Streptococci and Streptococcus pneumonia. Overall 82.9% isolates were from early onset cases while 17.1% were from late onset cases.

DISCUSSION AND CONCLUSION

Sepsis is a systemic inflammatory response to infection, isolation of bacteria from blood is considered the gold standard for the diagnosis of neonatal sepsis[xi]. But it is a lengthy investigations and may takearound 48 to 72 hours for the results. So to improve the outcome associated with neonatal sepsis, it is very necessary for a diagnostic test to be rapid and sensitive to decrease delay in treatment but at the same time in order to avoid unnecessary exposure to antibiotics and invasive procedures, a test with higher specificity is a need of a hour. A large number of studies have been performed to evaluate the use of complete blood count (CBC), differential count, and immature to total leukocyte ratio (I:T) for the diagnosis of neonatal sepsis. Although the CBC has a poor predictive value, serial normal values can be used to enhance the prediction that bacterial sepsis is not present[xii].

Bacteria are commonly implicated in neonatal sepsis, neonatal sepsis syndrome can also be caused by organisms other than bacteria like adenovirus, enterovirus, rubellavirus, Toxoplasma species and Candida species[xiii].Improper collection of blood samples and after administration of empirical antibiotics can also result in poor recovery of the bacterial pathogens in culture. In our study 41 (37.3%) were culture positive. These results were different than other studies of the clinically suspected cases were blood culture positive which ranges from 13–22%[2, xiv].

The most common etiological agent was Klebsiella pneumonia. Similar results were shown in other studies [2,14]. Early-onset neonatal sepsis is generally acquired transplacentally or as an ascending infection from cervix or during passage of the baby through a colonized birth canal[13].

In a study by Panigrahi P Gram negative organisms were identified on 58 (69%) blood cultures, gram positives on 22 (26%), mixed infections on 3 (3.6%), and fungi (*Candida sp*.) was identified on one culture . The most frequent pathogen was *Klebsiella* which was found on 39 cultures (46%; 37 as a single organism and 2 mixed infections, one with *E. coli* and one with Streptococcus sp.), followed by *S. aureus* (26%; 21 single organism and 1 mixed infection with *E.coli*) and *E. coli* (15%; 11 single organism and 2 mixed infections previously noted). Group B Streptococcus was not isolated on any culture, although *Streptococcus sp*[xv]. Similar organisms were isolated in our study , 23 were Klebsiella

pneumonia isolates of which 18 (43.9%) were from early onset and 5 (12.2%) were late onset. 2 Escherichia coli were isolated from early onset sepsis cases. 2 Acinetobacter sp., 3 Pseudomonas aeruginosa,4 CONS, 2 Group B Streptococcus and 1 Listeria monocytogenes was isolated from early onset sepsis cases. One isolate each from late onset sepsis cases were Coagulase negative Streptococci and Streptococcus pneumonia

In our study the blood culture positivity was higher 37.3%. klebsiella pneumonia was the commonest organism isolated in early as well as late onset sepsis. Proper management should be done to decrease the rate of incidence of sepsis by Klebsiella and empirical regimen should be modified depending on the antibiogram of the isolates.

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