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Microbial Profile and Antimicrobial Susceptibility pattern of Organisms isolated in Neonatal Sepsis in Tertiary care Hospital

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A B S T R A C T

Neonatal Sepsis is one of the leading causes of neonatal morbidity and mortality worldwide. Frequent monitoring on causative pathogens and their antimicrobial susceptibility pattern is mandatory for the better treatment. The present study was undertaken to identify the common bacterial pathogens causing Neonatal sepsis and their antimicrobial susceptibility pattern at Neonatal Intensive Care Unit (NICU). Blood cultures were performed for 400 clinically suspected cases of neonatal septicaemia and 36% (144 cases) were culture positive. Of these, 61% cases were early onset septicemia (EOS) and 39% were late onset septicemia (LOS). Among culture positive cases, the bacteriological profile was found highest for *Klebsiella pneumoniae* (59.7%) followed by Acinetobater species (16.6%) among Gram negative isolates and CoNS(4%) was the predominant Gram-positive pathogen. Imipenem showed highest 100% sensitivity and Cefotaxime least (30 %) sensitivity to Gram-negative isolates. This concludes that broad range of bacteria are associated with neonatal sepsis and revealed variation in antimicrobial susceptibility pattern among bacterial isolates.

Introduction

Neonatal sepsis may be defined both clinically as "a clinical syndrome characterized by systemic signs and symptoms of bacteremia during the first 28 days of life" (Veereswara Rao Kurma *et al.*, 2019) and/or microbiologically by positive blood cultures in the first four weeks of life (Vergnano *et al.*, 2005). Despite the advances in neonatal care having reduced complications and improved survival in neonates, sepsis is still contributing significantly to neonatal morbidity and mortality (Shah and Padbury, 2014). Neonatal

septicemia can be classified into Early-onset septicemia (EOS) which manifests with in the first 72 hours of life and Late-onset septicaemia which occurs (LOS) after 72 hours of life (Kali *et al.,* 2019). The importance of this classification is it helps to guide antibiotic therapy by implying differences in the mode of transmission and the predominant causative organisms. (Shah and Padbury, 2014) EOS is caused mainly by bacteria transmitted from mothers to neonates during the intrapartum period, these are bacteria prevalent either in the maternal genital tract or in the area of delivery. LOS is caused by postnatal acquisition of the pathogens by the bacteria which thrive in the external environment of the hospital or home (Veereswara Rao Kurma *et al.,* 2019; Shah and Padbury, 2014)

Materials and Methods

The aim of the study was to identify the bacterial isolates and their antimicrobial susceptibility pattern in neonates admitted to the neonatal intensive care unit (NICU) of a tertiary care hospital. The present study was carried out from March 2019 To June 2019 in Microbiology Department, Govt. Mohankumaramangalam Medical College Hospital, Salem after getting Institutional Ethics committee approval.

A total of 400 suspected cases of neonatal septicaemia were included in the study. One to Two millilitres of blood was collected from the neonates aseptically preferably before administration of the antibiotics and inoculated into 10 - 20 ml of sterile brain heart infusion broth. Blood culture bottles were transported immediately to the Microbiology Laboratory and the bottles were incubated aerobically at 37^0C for 7 days and subcultured on blood agar and Mac Conkey agar plates at 48 hours and 7 days or at an in-between period when visible turbidity appeared. The isolates were processed as per standard microbiological techniques and the isolates were identified (Bailey *et al.,* 2007).

Antimicrobial susceptibility testing was performed on Mueller-Hinton agar plates by modified Kirby-Bauer disk diffusion method as per Clinical Laboratory Standard Institute guidelines (CLSI, 2017). The organisms were classified based on the time-point at which the blood was collected for culture: Up to 72 hrs as causing early onset sepsis and >72 hrs as causing late onset sepsis.

Results and Discussion

Out of 400 blood samples received from suspected neonates, septicemia could be confirmed by culture in 36% (144) of cases. Prevalence of occurrence of EOS was much higher 88 (61%) in neonates compared to LOS in 56 (39%) neonates.

In the present study, Gram-negative organisms predominated being responsible for 93% of cases of septicaemia. The predominant organisms identified were *Klebsiella pneumonia*e 86 (59.7%) followed by *Acinetobacter* species 24 (16.6%) *Escherichia coli* 17 (11.8%) and *Pseudomonas* species 7 (4.8%). Among Gram positive organisms, Coagulase Negative Staphylococci was the most common organism isolated 6(4%), followed by *Staphylococcus aureus* 4(2.8%).

Gram negative organisms were highly sensitive to Imipenem (100%), followed by Piperacillin-Tazobactam(90-100%) CFS (85-100%) and showed least sensitivity to Cefotaxime (30-50%). Gram positive organisms were highly sensitive to Vancomycin and Linezolid (100%). The culture positivity rate in our study was 36%, Similar study was reported by Subitha *et al.,* (2015) 33%. Muley *et al.,* (2015) reported culture positivity rate of 26.6% and 16.9 % by

Nikita Singh Yadav *et al.,* (2018). In contrast higher isolation rate was reported by Mythri *et al.,* (2016) as 43.14%.

In the present study 61% of cases presented as EOS and 39% cases as LOS, suggesting more no. of cases in EOS. The present study findings are in accordance with Muley *et al.,* (2015) study reporting 66.7% EOS and 33.3% LOS and Jyothi *et al.,* (2013) study showing 74.8% EOS and 25.2% LOS. In contrast Mythri *et al.,* (2016) showed 48.64% cases of LOS and 34.31% of EOS. In the present study, Gram negative isolates accounted for 93% of total isolates, which is similar to the following studies reporting higher prevalence of Gram negative isolates. 83.88% Gram negative isolates by Sabharithasekar *et al.,* (2017), 55.7% by Jyothi *et al.,* (2013) and 68.3% by Veereswara Rao Kurma *et al.,* (2019).

In the present study the major pathogen isolated was *Klebsiella pneumoniae*, which was similar to other studies by Muley *et al.,* (2015) and Mythri *et al.,* (2016). In Contrast Nikita Singh Yadav *et al.,* (2018) had reported *Staphylococcus aureus* as major pathogen in his study.

Table.1 Bacteriological profile of Neonatal Septicemia

Name of the organism	Number of Isolates & (%)
Gram Negative isolates	
Klebsiella pneumoniae	86(59.7%)
***Acinetobacter* species**	24(16.6%)
Escherichia coli	17(11.8%)
***Pseudomonas* species**	7(4.8%)
Gram Positive isolates	
CoNS	6(4%)
Staphylococcus aureus	4(2.8%)
Total	144

Table.2 Antimicrobial susceptibility pattern of gram negative isolates (n=134)

Antibiotics	*Klebsiella pneumoniae* (N=86)	*Acinetobacter* species (N=24)	*Escherichia coli* (N =17)	*Pseudomonas* species (N=7)
Amikacin	65%	40%	95%	70%
Gentamicin	50%	40%	80%	50%
Ciprofloxacin	50%	55%	45%	80%
Cotrimoxazole	55%	75%	50%	-
Cefotaxime	30%	50%	55%	-
Amoxyclav	30%	-	30%	-
Cefaperazone-Sulbactum	85%	90%	100%	80%
Piperacillin-Tazobactam	80%	95%	100%	100%
Imipenem	100%	95%	100%	100%
Ceftazidime	-	65%	-	70%

Table.3 Antimicrobial susceptibility pattern of gram-positive isolates (n=10)

Antibiotics	CoNS (N=6)	*Staphylococcus aureus* (N=4)
Cefoxitin	50%	70%
Penicillin	40%	40%
Erythromycin	30%	40%
Cotrimoxazole	30%	30%
Doxycycline	70%	60%
Clindamycin	75%	65%
Vancomycin	100%	100%
Linezolid	100%	100%

Fig.1 Culture positivity among suspected septicemic Neonates

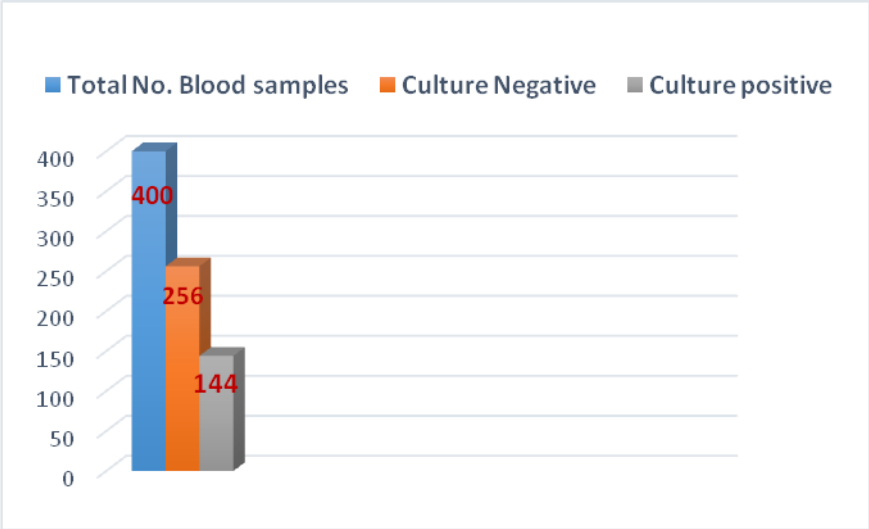
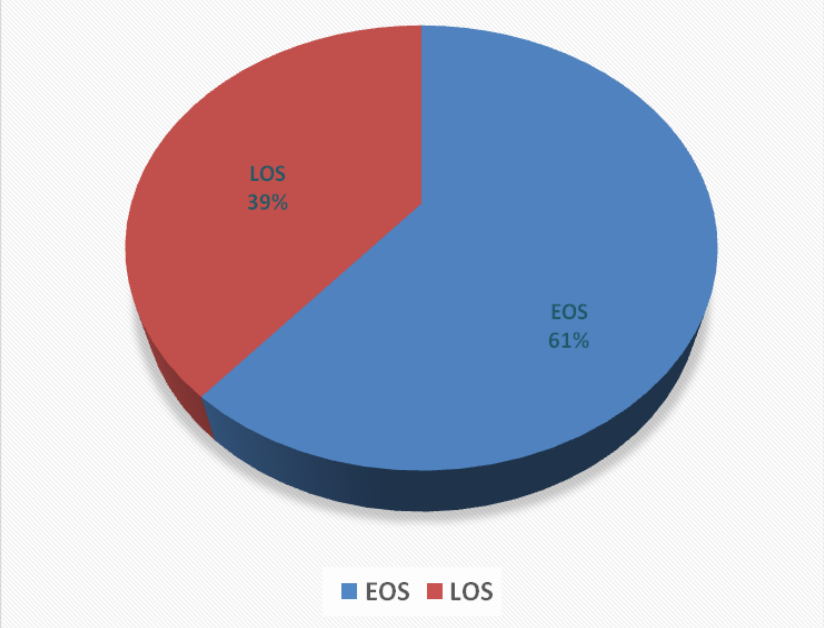


Fig.2 Prevalence of EOS and LOS



Antimicrobial susceptibility pattern was studied for all isolates causing Neonatal sepsis. The analysis of drug sensitivity pattern showed that among gram negative isolates 100% sensitivity to Imipinem., followed by Piperacillin-Tazobactam (90-100%) CFS (85-100%) and showed least sensitivity to Cefotaxime(30-50%). Gram positive organisms were highly sensitive to Vancomycin and Linezolid (100%), This finding is similar to other studies by P Jyothi *et al.,* (2013) and Kali *et al.,* (2019). In this study MRSA was 30% which is similar to 31.25% by Gandhi *et al.,* (2016). MR CoNS was 50% in our study which is similar to 56.67% by Sabharithasekar *et al.,* (2017). Currently, emergence of multidrug resistant bacteria imposes challenges in treatment of neonatal sepsis. Therefore, the knowledge of prevalence of local isolates and their antimicrobial sensitivity pattern is of utmost necessary for prompt antimicrobial therapy of neonatal sepsis.

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