

Bacteriological Profile of Neonatal Sepsis in Neonatal Intermediate Care Unit of Central Paediatric Referral Hospital in Nepal

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ABSTRACT

Background: Sepsis is one of the leading causes of neonatal morbidity and mortality. Because of difference in local epidemiology and possible variation with time, regular monitoring and updates on pathogen and their antimicrobial sensitivity pattern is important for prevention and treatment.

Methods: A retrospective descriptive study was carried out among cases of neonatal sepsis admitted in neonatal intermediate care unit of Kanti Children's hospital from August 2014 to August 2015. The data was collected from medical records of neonatal intermediate care unit and microbiology department and analyzed using SPSS version 20.

Results: There were 644 admissions, among which 210 (32%) were suspected of having neonatal sepsis. Thirty (14%) of the suspected cases had positive blood culture. Proportions of late and early onset were 25 (83.3%) and 5 (17.7%) respectively. In blood culture *Staphylococcus aureus* was the most common organism (80%), followed by Coagulase negative *Staphylococcus* (6.66%), *Acinetobacter* (6.66%), *Enterobacter* species (3.33%) and *Morganellamorgoni* (3.33.5%). Gram positive organisms were isolated in all cases of early onset sepsis and in 84% of late onset sepsis. Most of the isolated organisms showed sensitivity to amikacin, cloxacillin, ciprofloxacin and vancomycin.

Conclusions: This study has indicated possible emergence of *Staphylococcus aureus* as the dominant cause of neonatal sepsis. Cloxacillin, amikacin, ciprofloxacin have high proportion of efficacy against the commonly isolated bacteria in neonatal sepsis.

Keywords: Neonatal sepsis; drug sensitivity; risk factor.

INTRODUCTION

Sepsis is one of the leading causes of neonatal morbidity and mortality.¹ According to the World Health Organization, neonatal mortality rate is 23/1,000 live births.² That is approximately four million neonates death per year throughout the globe.³ Among which 75% of all neonatal deaths occur in developing countries.⁴ Neonatal mortality rate of Nepal is 33 per 1,000 live births and sepsis is one of the leading cause.⁵ In year 2070/71 of the total neonates presenting to government health facilities, 13.9% had possible bacterial infection and 42.1% had local bacterial infection. The major causes of neonatal deaths in Nepal are infection, birth asphyxia, preterm birth, and hypothermia.⁵

Neonatal sepsis is broadly divided according to onset

into early and late onset. Infection acquired within 72 hours and after 72 hours of birth are termed as early and late onset sepsis respectively. Because of difference in pathogens and pathogenesis, differentiation of sepsis is important for prevention and treatment.⁶ Risk factors for early onset are maternal fever, prolonged rupture of membrane (>18 hours), preterm, low birth weight⁷ whereas for late onset low birth weight, parental nutrition, ventilator or continuous positive airway pressure treatment, central venous catheterization for >10 days, use of H₂ blocker are risk factors.⁸⁻¹⁰ Hypoxia, acidosis and hypothermia also contribute to the risk and severity of neonatal sepsis.¹¹

The local epidemiological pattern of sepsis can be variable and this pattern can change with time. Thus

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regular monitoring and updates on the causes of neonatal sepsis and the antimicrobial sensitivity pattern is important for effective treatment and prevention of neonatal sepsis. We conducted this study to find out the current etiologic patterns of neonatal sepsis and their antimicrobial sensitivity in patients admitted to neonatal intermediate care unit of Kanti Children's Hospital and compare with previous years as well as other settings so that the findings would serve as a guide to further studies and for the choice of empiric antibiotic treatment.

METHODS

We retrospectively evaluated the cases of neonatal sepsis after ethical clearance from the institutional review committee of the hospital. All data were collected from medical record of neonatal intermediate care unit and microbiology department of Kanti children's hospital from August 2014 to Aug 2015. A total of 644 patients were admitted during the study period, out of which 210 were suspected neonatal sepsis. From the cases with culture proven sepsis, the following details were recorded: age, weight, sex, gestation and results of blood culture and antibiotics sensitivity pattern. Data was analyzed using SPSS version 20.

RESULTS

During the study period there were 644 admissions,

among which 210 were suspected of having neonatal sepsis, accounting for 32% of total admissions. Out of the suspected sepsis cases, 30 patients (14%) had positive blood culture. There were 18 (60%) and 12 (40%) male and female neonates respectively. Prevalence of occurrence of late onset sepsis 25 (83.3%), was much higher in comparison to early onset 5 (17.7%) sepsis. Term neonates, born after 37th weeks of gestation, were 24 (80%) while preterm were 6 (20%). Newborn with normal birth weight were 20 (67%) while 10 (33%) were low birth weight. *Staphylococcus aureus* was the most commonly isolated organism (80%) followed by Coagulase negative *Staphylococcus* (6.66%), *Acinetobacter* (6.66%), *Enterobacter* species (3.33%) and *Morganella morganii* (3.33%) (table 1). Gram positive organisms were isolated in all cases of early onset sepsis and in 84% of late onset sepsis. Most of the isolated organisms showed sensitivity to amikacin, cloxacillin, ciprofloxacin and vancomycin. (Table 2).

Table 1. Bacterial isolates

Organism	Number	Percentage
<i>Staphylococcus aureus</i>	24	80%
CONS	2	6.66%
<i>Acinetobacter</i> sp.	2	6.66%
<i>Enterobacter</i> sp.	1	3.33%
<i>Morganella morganii</i>	1	3.33%

CONS= Coagulase Negative *Staphylococcus*

Table 2. Antibiotic susceptibility pattern of bacterial isolates.

Antibiotics	Organisms										
	<i>S. aureus</i>		CONS		<i>Acinetobacter</i>		<i>Enterobacter</i>		<i>M. morganii</i>		
	S	R	S	R	S	R	S	R	S	R	
Amoxycillin	0	2	-	-	-	-	±	-	-	-	-
Cloxacillin	11	0	0	1	-	-	-	-	-	-	-
Amikacin	20	0	2	0	1	1	±	0	1	0	
Ciprofloxacin	19	0	1	1	2	0	1	0	1	0	
Vancomycin	14	0	1	0	-	-	-	-	-	-	-
Ceftazidime	-	-	-	-	-	-	-	-	1	0	-
Azithromycin	4	1	1	0	-	-	-	-	-	-	-
Piperacillin + tazobactam	-	-	-	-	0	1	-	-	-	-	-
Cefixime	-	-	-	-	1	1	-	-	1	0	-
Penicillin	9	1	1	0	-	-	-	-	-	-	-

DISCUSSION

Our center being exclusively children's hospital doesn't have facilities for delivery so all of our patients are out born and referred. Our study was conducted in Neonatal Intermediate Care Unit, where the admitted neonates

are of relatively less severe illnesses that do not require ICU or ventilator support. Sick and low birth weight neonates preferentially get admitted or transferred to NICU. This could explain the higher proportion of term babies and higher incidence of late onset neonatal sepsis in our study which is in contrast to the findings of a

study by Thapa B et al in NICU of Paropakar Maternity and Women's Hospital in 2011 where early onset sepsis accounted for 91.4% of the neonatal sepsis patients.¹²

In our study, only 13.3% isolates were gram negative. We found *Staphylococcus aureus* to be the most common isolate in neonatal sepsis accounting for 80% of total isolates. In a study conducted by Shrestha NJ et al in the same set up in 2013, *E. coli* was found to be most common isolate and *Staphylococcus aureus* was the second most common, accounting for 40% of total isolates. Gram negative and Gram positive isolates were 57% and 43% respectively.¹³ Similarly in a study by Shrestha S et al in NICU of Kathmandu University Hospital, Dhulikhel, in 2010, 18% of the isolates were *Staphylococcus aureus*; Gram negative and Gram positive isolates were 60% and 39% respectively.¹⁴ Our results are different than both these studies. But with just thirty culture positive cases in our study, it is difficult to draw conclusion whether this difference represents a real changing pattern of etiology in neonatal sepsis.

In our study all five cases of early onset sepsis were caused by gram positive organisms. It is expected as early onset sepsis is due to the organism from maternal genitalia and most common organism from maternal genitalia is group B *Staphylococcus* (GBS) which is gram positive. But this finding is in contrast with the finding of the study by Shrestha S et al in Kathmandu University Hospital, where the most common cause of early onset sepsis was *Klebsiella*¹⁴

In sensitivity testing, all the isolates of *Staphylococcus aureus* were sensitive to cloxacillin, amikacin, ciprofloxacin, and vancomycin. In the study by Shrestha S et al in Kathmandu University Hospital, 92% isolates of *Staphylococcus aureus* were sensitive to amikacin and cloxacillin and 100% were sensitive to vancomycin. *Staphylococcus aureus* was common in LOS. In the study by Thapa B et al Paropakar Maternity and Women's Hospital, resistance of *Staphylococcus aureus* to amikacin and cloxacillin were 27% and 40% respectively and all isolates were sensitive to vancomycin. but whether this organism is common on LOS or EOS was not mentioned¹² Our study has found all these antibiotics as well as ciprofloxacin to be effective against *Staphylococcus aureus*.

Resistance to cloxacillin was seen in one isolate of CONS, the same isolate also showed resistance to ciprofloxacin. All other isolates tested for ciprofloxacin were sensitive to this antibiotic. Resistance to amikacin was noted only in one isolate of Actinobacter species. Thus cloxacillin, ciprofloxacin and amikacin are other antibiotics that could be effective against most of the commonly iso-

lated organisms in neonatal sepsis.

Of noteworthy mention is the sensitivity of 90% isolates of *Staphylococcus aureus* to Penicillin. This is in contrast to the findings of Ansari S et al in their study among post-neonatal children conducted in Chitwan Medical College from 2012 to 2013, where they found 89% isolates of *Staphylococcus aureus* to be resistant to penicillin.¹⁵ Our finding of this oldest and one of the cheapest antibiotics showing such high level of sensitivity is an encouraging fact that needs further exploration.

CONCLUSIONS

Studies looking into the etiologies of neonatal sepsis need to be conducted in regular basis for monitoring local epidemiologic pattern. Our study has indicated possible emergence of *Staphylococcus aureus* as the dominant cause. Cloxacillin, amikacin, ciprofloxacin have high proportion of efficacy against the commonly isolated bacteria in neonatal sepsis. The efficacy of penicillin against *Staphylococcus aureus* needs further studies for confirmation.

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