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Original article:

Bacteriological profile and antibiotic susceptibility of neonatal sepsis in neonatal intensive care unit of a tertiary care centre

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ABSTRACT:

BACKGROUND: Neonatal sepsis refers to infection involving bloodstream in newborns less than 28 days old. It continues to remain a leading cause of morbidity and mortality among newborns ,especially in middle and low income countries.

AIMS AND OBJECTIVES: study of bacteriological profile of sepsis and the antibiotic susceptibility of neonatal sepsis among newborns in neonatal intensive care unit.

METHODS: This was a retrospective cross sectional study done at Basaveshwara medical college and Hospital, Chitradurga on 54 neonates with culture proven sepsis in newborns admitted to neonatal intensive care unit over one year period (August 2021 to August 2022) were identified using medical records database. All neonates with a clinical suspicion of sepsis with appositive blood culture were identified , their clinical details ,maternal risk factors and laboratory data were included in the study.

RESULTS: Of the 290 neonates admitted in neonatal intensive care unit , 54 had culture positive sepsis (18.6%). The majority were late onset sepsis (n = 39, 72.2%) and were among the preterm babies (n=30, 55.5%) . Most bacterial isolates were gram negative predominantly klebsiella species (n= 19, 35.1%) klebsiella species showed resistance to commonly used antibiotics such as Oxacillin (100%) and Cefotaxime (90%) . However they showed good susceptibility to Amikacin (100%) and Carbapenems (100%) among cultures with pseudomonas species , showed high resistance to Oxacillin (100%) and Carbapenems (80%) and showed good susceptibility to Piperacillin – Tazobactam (50%) and Amikacin (50%).

CONCLUSION: Klebsiella and Psuedomonas species were the most common causes of neonatal sepsis in our study . Implementation of effective preventive strategies to combat the emergence of antibiotic resistance is urgently needed . We recommend a combination of Piperacillin- Tazobactam and Amikacin as the first line therapy and combination of Vancomycin and Carbapenem as the second line empirical therapy in our neonatal intensive care unit.

KEYWORDS: Antibiotic susceptibility , Klebsiella , Neonatal sepsis , Neonatal intensive care unit.

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INTRODUCTION

Sepsis is considered one of the leading causes of neonatal mortality globally. Emergence of antimicrobial resistance has become a global concern . with a limited reserve of antibiotics ,increasing antimicrobial resistance ,has become a great challenge in management of neonatal sepsis . knowledge of prevalent bacterial isolates and their antibiotic susceptibility pattern is crucial when choosing the appropriate empirical therapy in order to decrease morbidity and mortality. We aim to determine the prevalence of culture positive sepsis, its clinicobacteriological profile and antibiotic susceptibility pattern in NICU of Basaveshwara medical college hospital, Chitradurga.

Objectives of study- study of bacteriological profile of neonatal sepsis and the antibiotic sensitivity pattern among newborns with sepsis in NICU

METHODOLOGY

Study design: Retrospective cross-sectional study.

Study period: August 2021 to August 2022

Study area: NICU Basaweshwara medical college and hospital Chitradurga.

Sampling procedure:

Sample size: 54

Inclusion criteria:

newborns with culture positive sepsis

Exclusion criteria:

Statistical analysis: The data will be entered into excel spread sheets and analyzed using SPSS Software version 20.Results of the categorical variables will be presented using proportions and analyzed using chi square test and results of continuous variables will be presented as Means and analyzed using T test and other appropriate statistical measures will be applied.

RESULTS

Of 290 neonates admitted in the NICU, 54 had culture positive sepsis (18.6%). The majority were late onset sepsis (72.2%) and were among the preterm babies (55.5%)

TABLE 1 ; **GENERAL CHARECTERISTICS AND CLINICAL PROFILE**

Neonatal variables	Early onset sepsis	Late onset sepsis	Total	P value
gender				
Male	7	20	27	0.761
female	8	19	27	
Gestational age at birth				
Preterm	10	20	30	0.31

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Term	5	19	**24**	
Birth weight				
<2500g	10	20	30	0.31
>2500g	5	19	24	
Mode of delivery				
Vaginal delivery	4	20	24	0.75
LSCS	6	24	30	
Maternal variables				
PROM	6	18	24	0.683
Foul smelling liqour	4	2	6	0.024
Maternal antibiotics	1	0	1	0.47
Maternal group B streptococcal colonization	2	2	4	0.302
Neonatal care variables				
Need of inotropes	3	19		0.05
Need of PPV	2	24		0.001
Central line	9	12		0.048
mortality	5	4		0.041

TABLE 2 : DISTRIBUTION OF THE BACTERIAL ISOLATES

ISOLATE	NUMBER
Gram negatives	
Klebsiella	19
Enterobacter	2
e. coli	12
Pseudomonas	18
Acinetobacter	2
Gram positives	
CONS	1
Total	54

Most bacterial isolates were gram negative predominantly klebsiella species (35.1%

TABLE 3 : ANTIBIOTIC RESISTANCE

Beta lactam	**Klebsiella**	**pseudomonas**	**enterobacter**	**acinetobacter**	**e.coli**
Oxacillin	18/18	2/2	2/2	2/2	1/1
cefotaxime	9/10	4/6	1/2	1/2	2/6
meropenam	0/16	4/5	0/2	0/2	1/3
Piptaz	7/8	1/2	1/2	1/2	8/10
Non beta lactam					
amikacin	0/16	5/10	1/2	1/2	1/3
gentamycin	10/12	7/12	2/2	2/2	8/8
ofloxacin	8/10	6/12	2/2	2/2	8/12
Linezolid	13/18	1/12	1/2	2/2	4/8
vancomycin	1/1	4/8	2/2	0/2	2/8
tigecycline	2/18	1/8	0/2	0/2	1/3

Klebsiella species showed resistance to commonly used antibiotics such as oxacillin (100%) and cefotaxime (90%).

TABLE 4 : ANTIBIOTIC SENSITIVITY

Beta lactam	klebsiella	pseudomonas	enterobacter	acinetobacter	E.coli
cefotaxime	10%	34%	50%	50%	70%
meropenam	100%	20%	100%	100%	67%
Piptaz	10%	50%	100%	50%	20%
Non beta lactams					
Amikacin	100%	50%	50%	50%	67%
Gentamycin	17%	42%	0	0	0
Ofloxacin	20%	50%	0	0	34%
Linezolid	28%	17%	50%	0	50%
Vancomycin	0	50%	0	100%	75%
Tigecycline	89%	88%	100%	100%	67%

Klebsiella species showed good susceptibility to carbapenams (100%) and tigecycline(88.8%)

DISCUSSION:

Neonatal sepsis is considered the leading cause of infant mortality and morbidity in NICU. Variations in culture positivity rate of neonatal sepsis in different studies seem to rise from differences in culture techniques and study designs . the majority of the culture positive sepsis was early onset sepsis and among preterm and low birth weight neonates , similar to the study findings of Kathmandu University Hospital , Dhulikhel , Nepal. The most common

clinical manifestation of neonatal sepsis in our study majority had raised CRP (75%) and low platelet count (84%). Klebsiella species were the most frequent causative organisms of neonatal sepsis in our study , a similar finding to that of Shrestha S et al. Our study shows, the majority of causative organisms have developed resistance to these frequently used antibiotics Amoxicillin , Cefotaxime and Oxacillin from the beta lactam group. Both gram negative and gram positive organisms showed high susceptibility to Carbapenams . Vancomycin and Linezolid showed high susceptibility towards gram positive isolates , similar to the findings of Mullah SA et al.and Singh HK . Amikacin showed moderate susceptibility to both gram positive and gram negatives. Klebsiella the main gram negative isolate showed resistance to commonly used antibiotics such as Oxacillin (100%) and Cefotaxime (90%) . However they showed good susceptibility to Carbapenams (100%) and Tigecycline (88.8%). Pseudomonas species showed high resistance to Oxacillin (100%) and Carbapenams (80%) and showed good susceptibility to Piperacillin and Tazobactam(50%).

E. coli showed high resistance to the first and the second line empirical antibiotics used commonly in our institution , only demonstrating susceptibility towards Colistin and Tigecycline.Acinetobacter demonstrated good susceptibility to Ciprofloxacin , Colistin and Tigecycline . Group B Streptococcus , the most common cause of early onset sepsis in high income countries , has a low reported incidence in low and middle income countries . over diagnosis of premature rupture of membranes and chorioamnionitis and subsequent antibiotic treatment could be the reason for low yield of Group B Streptococcus at our institution. The retrospective design of our study , together with its single centered , small study populations and limited yield of some pathogens were all limitations in our study . hence large scaled multicenter prospective study are needed to validate our findings .

CONCLUSIONS:

Our study revealed gram negative isolates as the predominant pathogens in both early onset sepsis and late onset sepsis groups. Both gram positive and gram negative isolates showed high resistance to commonly used antibiotics. Such high antibiotic resistance is associated with significant neonatal morbidity and mortality. Based on our findings we recommend a combination of Piperacillin – Tazobactam and Amikacin as the first line therapy and a combination of Vancomycin and Carbapenem as the second line empirical therapying our NICU. The best prevention of neonatal sepsis comprises of early recognition of high risk infants and strict infection control practices , such as safe delivery , hand hygiene , avoidance of unnecessary invasive procedures and restricted entry to NICU.

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