

Bacterial Profile and Empirical Treatment of Neonatal Septicemia at a Tertiary Care Hospital in Bundelkhand Region

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ABSTRACT

Introduction: Neonatal sepsis is a significant cause of morbidity and mortality among neonates worldwide. It is important to know the etiology, various risk factors and antimicrobial sensitivity patterns of organisms that cause neonatal infections in developing countries in order to develop effective treatment strategies and to reduce neonatal mortality.

Aim: To evaluate bacteriological profile and empirical treatment of neonatal septicemia at a tertiary care hospital in bundelkhand region.

Material and Methods: Total 330 presumptive cases of neonatal septicemia were selected for the study. One set of blood sample from each cases were processed in accordance with standard protocols. Antibiotic susceptibility of isolates was performed by disc diffusion method according to CLSI guideline 2017.

Result: Out of 330 cases, 108 (32.7%) were blood culture positive while remaining 222 (67.3%) were negative. Out of the 108 blood culture positive cases, 61.1% cases were of age less than 3 days belonging to early onset septicemia and 38.8% cases were of age 4 to 28 days belonging to late onset septicemia. Among them percentage of males and females were 59 (54.6%) and 49 (45.3%)

respectively. The male to female ratio was 1.2:1. Coagulase negative Staphylococci (CONS) was the highest (34.2%) cause of septicemia in neonates followed by Staphylococcus aureus (32.4%), Escherichia coli (15.7%), Pseudomonas aeruginosa (12%) and Klebsiella pneumoniae (5.5%). Majority of gram positive isolates showed resistance to Penicillin (96.2%) and Erythromycin (71.8%) while 100% sensitive to Linezolid, Vancomycin and Gentamycin. Gram negative bacteria showed maximum resistance to Ampicillin (100%) and Amikacin (70%) while 100% sensitive to Imipenem.

Conclusion: This study concluded that Coagulase Negative Staphylococci and Staphylococcus aureus were found to be commonest organisms associated with neonatal sepsis. All Coagulase Negative Staphylococci and Staphylococcus aureus isolates were sensitive to Linezolid.

Keywords: Antibiotics, Early onset neonatal septicemia, Late onset neonatal septicemia, Neonatal septicemia

Abbreviations: Early onset neonatal septicemia (EONS), Late onset neonatal septicemia (LONS)

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in 2013, the highest for any country in the world [5].

The Neonatal mortality rate is not uniform across the country. Although, Kerala and Tamil Nadu have low NMRs (<20 per 1000 live births), Odisha, Madhya Pradesh and Uttar Pradesh have very high NMRs (35 or more per 1000 live births), Four states Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan alone contribute to 55% of total neonatal deaths in India and to 15% of global neonatal deaths that occur every year [6].

Neonatal sepsis is clinical syndrome which is characterized by signs and symptoms of infection which may or may not be accompanied

I. INTRODUCTION

Neonatal septicemia continues to be a major problem for neonates specially in Neonatal intensive care units (NICU) around the world [1]. Neonatal sepsis is a significant cause of morbidity and mortality among neonates worldwide [2,3]. World Health Organization has estimated that 1.6 million deaths occur globally every year due to neonatal infections and 40% of all neonatal deaths occur in developing countries like India [4]. India contributes to one-fifth of global live births and more than a quarter of neonatal deaths. Approximately 0.75 million neonates died in India

by bacteraemia within the first month of life (Mythri BA et al.,) [7]. Neonatal septicemia (NNS) can be classified into Early Onset Neonatal Sepsis (EONS) and Late Onset Neonatal Sepsis (LONS) based on the timing of onset of sepsis early onset sepsis presenting within 72hrs of birth and the late onset sepsis presenting after 72hrs of birth [8].

Neonatal septicemia (NNS) is a great masquerader and can present with very nonspecific manifestations pertaining to any system of the body. The gold standard for diagnosis of NNS is a positive blood culture, which is positive in only 50-80% at best, however, negative blood culture does not rule out the disease. It is important to know the etiology, various risk factors and antimicrobial sensitivity patterns of organisms that cause neonatal infections in developing countries in order to develop effective treatment strategies and to reduce neonatal mortality [9]. Both gram negative and gram-positive bacteria have been isolated from blood. Organisms causing sepsis and their susceptibility to different antibiotics vary from place to place [10]. As neonatal septicemia is life threatening emergency, early diagnosis and treatment with appropriate antibiotics is necessary. Aim of this study is to evaluate the bacterial profile and empirical treatment of neonatal septicemia cases at a tertiary care hospital.

II. MATERIALS & METHOD

The prospective observational study of six months was carried out in the Department of Microbiology, A total of 330 cases of presumptive septicemia neonatal cases from NICU and SNCU sent to Department of Microbiology were included in this study. All blood samples were collected in

Tulip blood culture bottle, approximately 2-3 mL of blood was inoculated and incubated as per recommended protocol. After incubation, sub-culture was done on Blood agar and MacConkey agar and obtained isolates was identified by their respective media, Gram staining and confirmed by the pattern of biochemical reaction using standard method. Antimicrobial susceptibility testing was performed for all blood culture isolates by Kirby-Bauer disc diffusion method as recommended in the CLSI guidelines 2017.

III. RESULT

Out of total 330 septicemia cases subjected for blood culture, 108 (32.7%) were positive while remaining 222 (67.2%) were blood culture negative. Of the 108 blood culture positive cases, 61.1% were of age less than 3 days belonging to early onset septicemia followed by 38.8 % were 4 to 28 days belonging to late onset septicemia (Figure 1). Among them 59 (54.6%) were males and 49 (45.3%) were females with male to female ratio of 1.2:1 (Figure 2). Coagulase negative staphylococci (CONS) was the highest (34.2%) cause of septicemia in neonates followed by *S. aureus* (32.4%), *E. coli* (15.7%), *Pseudomonas aeruginosa* (12 %) and *Klebsiella pneumoniae* (5.5 %) (Table 1). Majority of gram positive isolates showed resistance to Penicillin (96.2%) and Erythromycin (71.8%) while 100% sensitive to Linezolid, Vancomycin and Teicoplanin (figure 3). Gram negative bacteria showed maximum resistance to Ampicillin (100%) and Amikacin (70%) while (100%) sensitive to Imipenem (Figure 4).

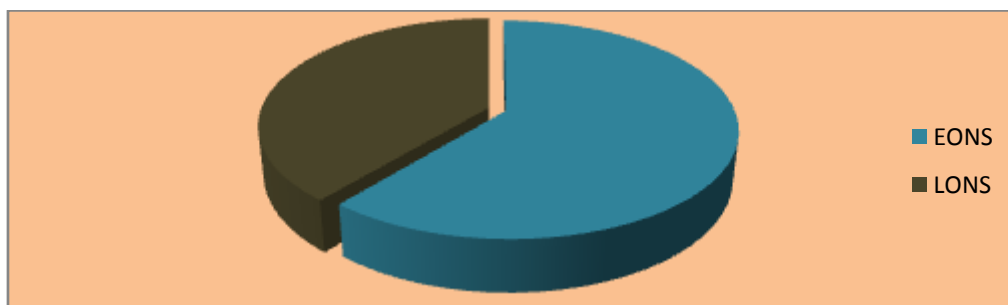


Figure 1: Distribution of Early onset sepsis and LONS

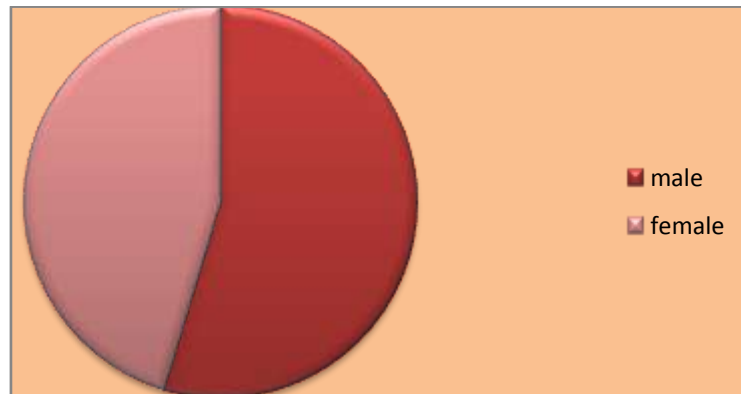


Figure 2: Distribution of Male and Female

Microorganisms	1-3days N (%)	4-28days N (%)
CONS (37)	24(64.8)	13(35.1)
Staphylococcus aureus (35)	18(51.4)	17(48.5)
Escherichia coli(17)	9(52.9)	8(47)
Pseudomonas aeruginosa(13)	10(76.9)	3(23)
Klebsiella species(6)	5(83.3)	1(16.6)
Total (108)	66(61.1 %)	42(38.8 %)

Table 1: Distribution of isolated organisms based on onset of sepsis

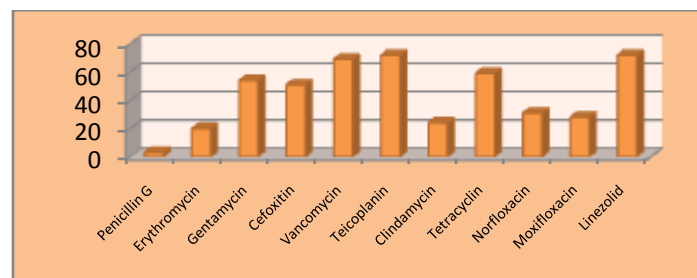


Figure 3: Antimicrobial sensitivity of Gram positive cocci

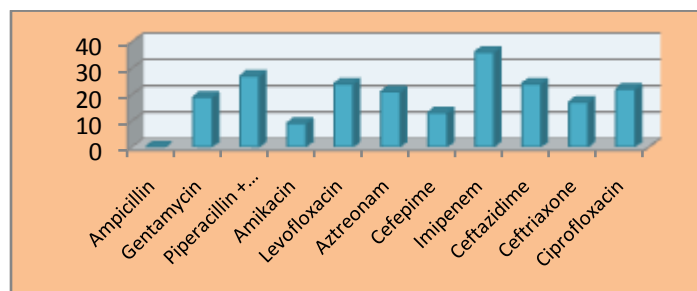


Figure 4: Antimicrobial sensitivity of Gram negative bacilli

IV. DISCUSSION

Neonatal septicemia remains a challenging and important problem even with modern drug therapy. It is associated with considerable

morbidity and mortality. It is difficult to diagnose the neonatal infection, because of its non-specific clinical signs and symptoms. For effective management of neonatal septicemia cases, study of

bacteriological profile with their antibiotic sensitivity pattern plays a significant role.

In the present study, blood culture positivity in neonatal septicemia cases was 108 (32.72%) which was similar to finding by Kamble et al., 35.86%, Veereswara et al., 35.2% however higher rates were reported by Bhatt et al. 55.6%, Malla et al., 57.22% and Premlata et al., 82.35% while lower rates were reported by Sumangala et al., 21.9%, Parajuli et al., 20.4%, Gyawali and Sanjana 15.13% and Ansari et al., [11-19]. However, the culture are negative cannot rule out the possibility of neonatal sepsis as the infection could be caused by anaerobic pathogens also which were not looked for in this study.

The culture isolation rate for early onset neonatal sepsis was 61.1% which is agrees with another study done by Zakariya et al., Jyothi et al., 74.8% and it is higher than the 34.31% by Mythri BA et al., [7,20,21]. The late onset neonatal sepsis rate was 38.8% in this study, In contrast to another study done by Shreshtha et al., where late onset neonatal sepsis was quite high 66.9% and some finding showed lower positivity rate 21.6% (Zakariya et al), 25.2% by Jyothi et al., [20,21,22].

In this study the septicemia was suspected in 108 neonates. Among them 59 (54.6%) neonates were male and 49 (45.3%) were female neonates. This is comparable with study done by Jyothi et al., [21].

There was an overall predominance of gram positive organism in the present study. Out of the positive culture, the Gram negative organism accounted for 33.33% and Gram positive organism accounted for 66.66% in contrast to the other reports where Gram negative organism was 62.34% and Gram positive organism was 37.66% (Mythri et al.,) [7].

In this study *Staphylococcus aureus* and Coagulase negative *Staphylococci* as the most common Gram positive organism causes septicemia. The Coagulase negative *Staphylococci* isolation rate is quite high as compared to Shreshtha et al., [22].

In this study the most common isolated organism was CONS 34.25%, which is similar with other reports (Mythri et al.,) and *Staphylococcus aureus* was 32.40% which is similar to another study reported that 38.8% of *Staphylococcus aureus* isolated from neonatal septicemia cases (Shreshtha et al.,) [7,22].

In this study the Gram positive organism showed good sensitivity to linezolid, Vancomycin

and Teicoplanin while resistance to penicillin this finding is agreed with the another study done by Kurma et al. and the gram negative organism showed good sensitivity to Imipenem, Piperacillintazobactam and Ciprofloxacin while highly resistance to ampicillin this finding is similar to another study done by Kurma et al., [12].

V. CONCLUSION

We concluded that CONS and *Staphylococcus aureus* was predominant isolates in this region in our study period and linezolid is a drug for empirical treatment. Depending on the antibiotic sensitivity pattern of the isolates, antibiotics should be used.

Conflict of Interest

Author declare that no conflict of interest.

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