

MICROBIAL ETIOLOGY OF NEONATAL SEPSIS AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PATTERN - A STUDY FROM THE TERTIARY CARE HOSPITAL OF THE SUB HIMALAYAN REGION.

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ABSTRACT

Background: Neonatal sepsis is a clinical syndrome of bacteremia with systemic signs and symptoms of infection in the first 4 weeks of life. Septicemia continues to be a major cause of neonatal mortality and morbidity worldwide. Globally 3 million newborns suffer from sepsis annually which led to 30% of deaths under five years of age. It is one of the four leading causes of neonatal mortality and morbidity in India. It is necessary to detect microbial profile and susceptibility patterns, for early diagnosis and prompt initiation of empiric treatment.

Material and Methods: SA descriptive analysis of culture results of neonatal sepsis was performed at the Department of Microbiology at Dr. RPGMC Kangra at Tanda over a period of three years i.e. from June 2019 to May 2022 was done. All isolates, both bacterial and fungal, were processed as per standard microbiological guidelines. Antimicrobial susceptibility was done by the Kirby Bauer disk diffusion method, as per CLSI guidelines.

Results: Of the total 955 samples, growth of microbes was obtained on 561 (59%) samples. Sterile samples were 394 (41 %). Male to female ratio was 1.7: 1. Bacterial growth was seen in 519 (92.6%) samples, and Fungal growth was seen in 42 (7.4%) samples. Gram negative bacteria were 265 (51%) were more prevalent than Gram positive bacteria 254 (49%). In Gram negative bacterial isolates *Acinetobacter* spp. 113 (43.4%) was the most common isolate and *Staphylococcus aureus* was major amongst gram positive isolates. *MSSA* 70 (29%) & *MRSA* 69 (28%), Amongst Gram positive isolates, Vancomycin (4%) showed the least resistance with Imipenem (12%) which was least resistance in gram negative isolates.

Discussion & Conclusion: Regular surveillance of local antimicrobial resistance and review of antibiotic guidelines in the neonatal unit should be maintained. Also, an antibiotic policy should be formulated in the hospital. Depending on the antibiotic sensitivity pattern of the isolates, antibiotics should be used to avoid the dangers of indiscriminate use of antibiotics.

Key words: CLSI- Clinical laboratory standard institute, MSSA-Methicillin sensitive Staphylococcus aureus, MRSA- Methicillin resistant Staphylococcus aureus, CoNS- Coagulase negative Staphylococcus

INTRODUCTION

Neonatal sepsis is a clinical syndrome of bacteremia documented by positive blood culture with systemic signs and symptoms of infection in the first 4 weeks of life.[1] Septicemia which occurs within 72 hours of birth is classified as early onset sepsis and late-onset sepsis, which presents at 72 hours after birth up to 28 days of life.[2]

Neonatal sepsis is a medical emergency and requires urgent diagnosis and treatment to prevent mortality.[3] Globally 3 million newborns suffer from sepsis annually which led to 30% of deaths under five years of age. [4] It is one of the four leading causes of neonatal mortality and morbidity in India.[5-7]

Various clinical conditions are included under neonatal sepsis like septicemia, pneumonia, meningitis, and urinary tract infections.[8] Clinically most frequently neonatal sepsis presented with fever, temperature instability, vomiting, diarrhea, irritability, lethargy, breathing problem, low blood sugar, jaundice, reduced sucking and seizures.[9]

Maternal genital tracts are usually responsible for early onset sepsis. Which occurs within 72 hours of birth and Late onset of sepsis is caused mainly due to community or nosocomially.[10] The emergence of multi drug resistant bacteria is a big challenge in neonatal sepsis.. This is mainly due to frequent use of antibiotics without bacteriological and susceptibility evidence.[11]

The results of this study will not only help to determine the causative organisms of sepsis in our population but also promote the judicious use of empirical antibiotics. This will result in a shorter hospital stay of neonates, reduction in adverse effects of drugs, and cost-effective management of sepsis.

MATERIAL AND METHOD

A descriptive analysis of culture results of neonatal sepsis was performed at the Department of Microbiology at Dr. RPGMC Kangra at Tanda over a period of three years i.e. from June 2019 to May 2022 was done. Aseptically collected blood samples were received in the laboratory and were inoculated on MacConkey and Blood agar plates and incubated aerobically at 37°C for 24 hours. Culture plates with colonies were considered for gram staining and identification is carried out by biochemical reactions.[12]

Antimicrobial susceptibility testing was done according to the standard operational procedures, in vitro antimicrobial susceptibility testing was done on Mueller-Hinton agar (Hi-Media Lab Ltd, India) using Kirby-Bauer disc diffusion method. A suspension of the test organism was made in sterile normal saline and turbidity adjusted to 0.5 McFarland standards. The test organism was uniformly seeded over the surface of Mueller Hinton agar plates. The plates were allowed to dry for 15 minutes before application of antibiotic discs. The plates were incubated at 37°C for 16-18 hours. After incubation clear zones around the antibiotic discs were measured with a ruler and recorded in millimeters. Susceptibility and resistance data was interpreted

according to Clinical laboratory Standards Institute guidelines and antimicrobial susceptibility was performed according to CLSI guidelines.[13]

RESULTS

Blood samples of suspected neonatal sepsis cases were processed as per the standard microbiology guidelines. A total of 955 samples were received, out of these 561(58.8%) samples showed microbial growth and 394(41.2%) samples were sterile. Out of these 955 samples 506(52.9%) were male and 449(47.1%) were females. Male to female ratio was 1.7:1 Out of 561 growth positive samples, 519(92.6%) samples showed bacterial growth and 42(7.4%) showed fungal growth. Bacterial isolates were further classified into Commensals 22 (5%), Pathogenic 404 (78%), Probable pathogens [CoNS] 93 (17%).

Overall Bacteriological profile [including CoNS] showed that Gram negative bacteria 265 (51%) were more prevalent than Gram positive bacteria 254 (49%).

In Gram negative bacterial isolates Acinetobacter spp. 115 (43.4%) was most common isolate followed by Klebsiella spp. 86 (32.5 %), Non fermenter group of organism(NFGO) 19 (7.1%), Pseudomonas spp. 18 (6.9 %), Escherichia coli 15 (5.7%), Citrobacter spp. 10 (3.7%), Enterobacter cloacae 2 (0.7%).

Gram Negative Isolates

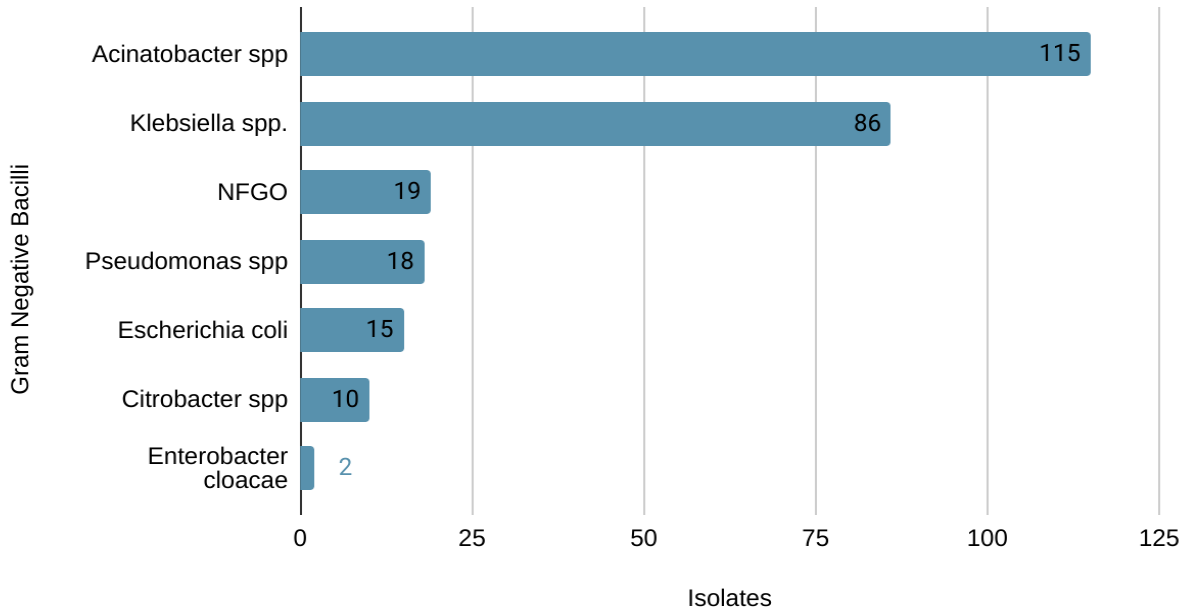


Figure 1: Gram negative bacterial isolates

In Gram positive bacteria isolates Staphylococcus aureus(59.4%) was the most common isolates which further divided into MSSA 76(30%) and MRSA 75(29.4%) followed by CoNS 93 (36.6%) and Enterococcus spp. 10(4%).

Gram Positive Isolates

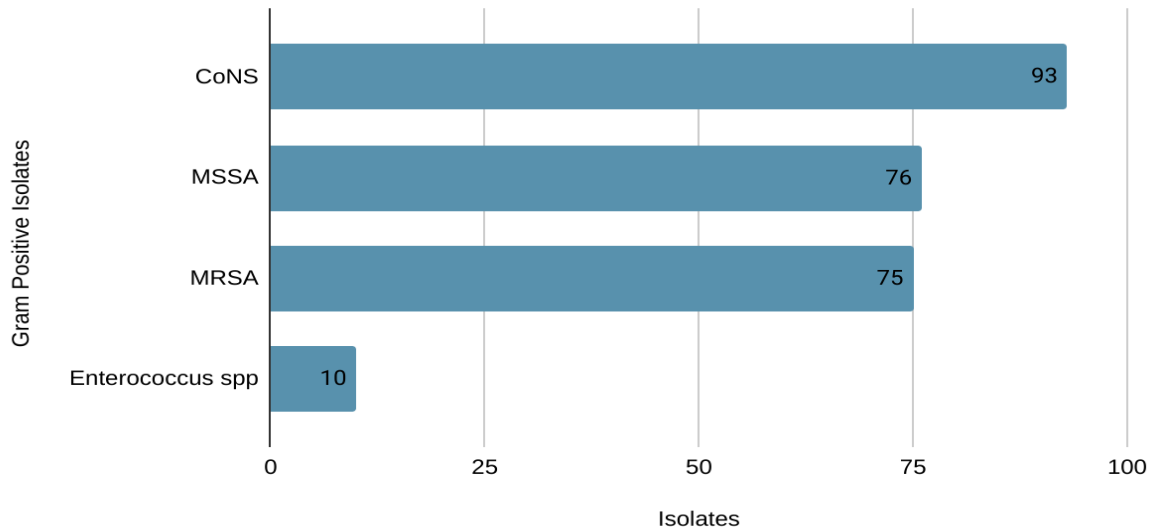


Figure 2: Gram positive bacterial isolates

Amongst Gram positive isolates, Penicillin 72% and Azithromycin 40% were the most resistant drugs, whereas Vancomycin 96% and Linezolid 91% were most susceptible.

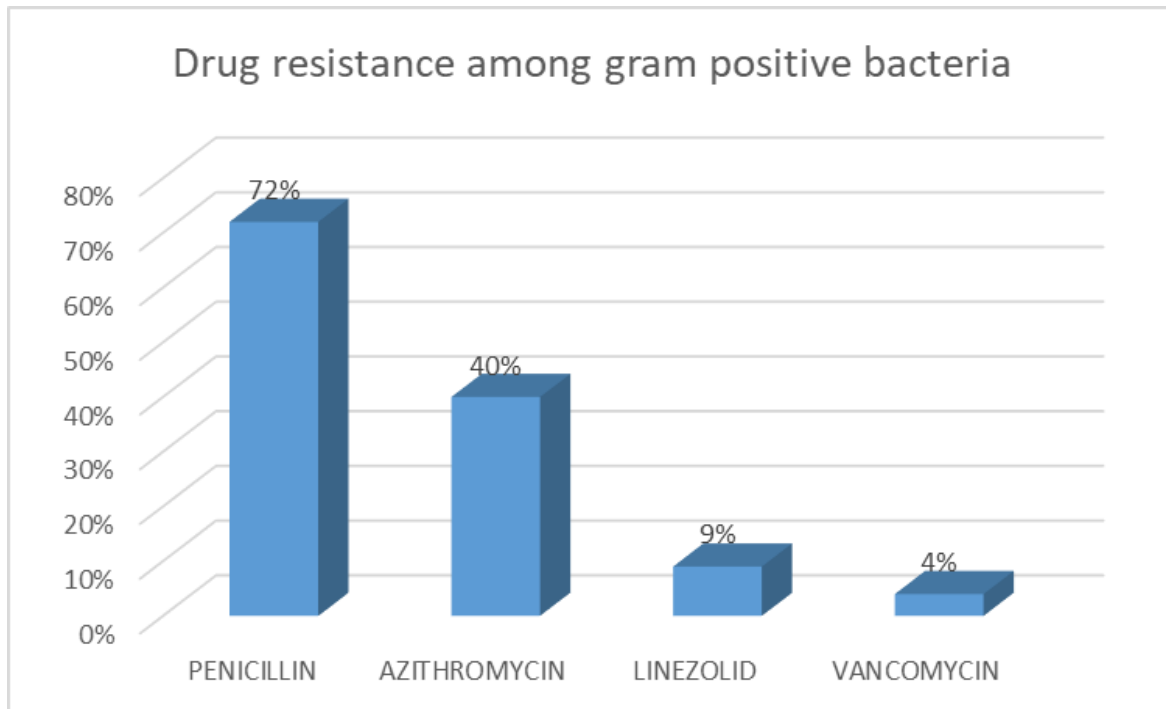


Figure 3: Antimicrobial susceptibility for gram positive bacterias

Amongst Gram negative isolates, Ceftazidime 54% and Gentamicin 49% were the most resistant drugs, whereas Amikacin 56% and Imipenem 88% were most susceptible.

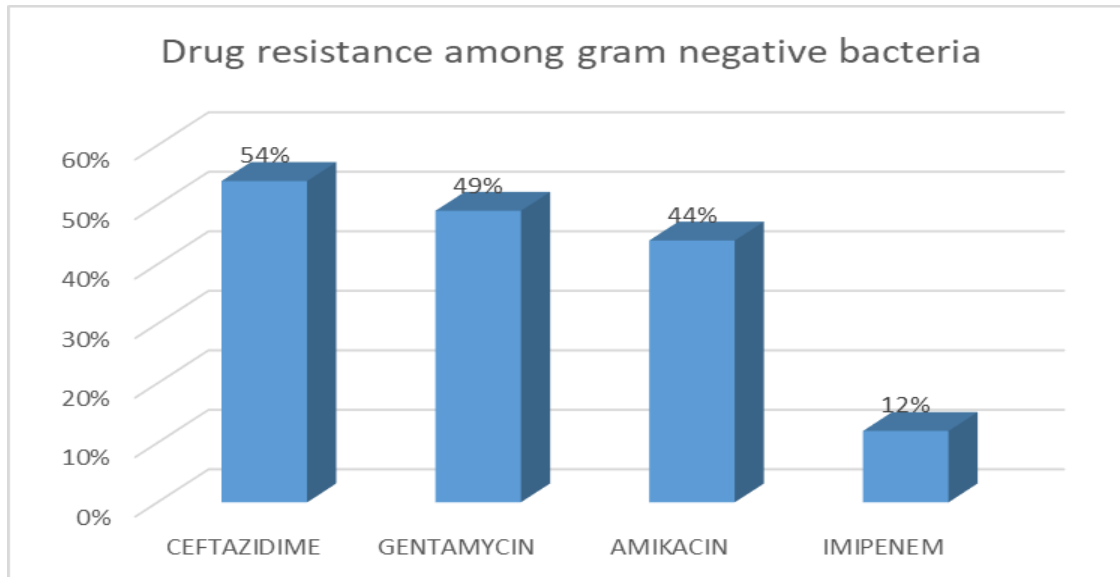


Figure 4: Antimicrobial susceptibility for gram negative bacterias

All fungal isolates were *Candida* spp. (42), *Candida albicans* 18 (43%) and Non *albicans* *candida* 24 (57%).

DISCUSSION

Neonatal sepsis is considered to be an important cause of neonatal morbidity and mortality. Developing countries share a high load of neonatal deaths globally. The timely diagnosis of neonatal sepsis plays an important role in determining the prognosis.

In our study out of 955 blood samples, 561(58.8%) showed bacterial growth, out of these positive samples the majority of the isolates were gram negative bacterial isolates than gram positive bacteria. Similar results were seen in study by Shaikh et al in their study.[14]Male predominance was seen in our study with male to female ratios of 1.7:1. In congruent to our study a study by Hossain et al showed male to female ratio of 1.9:1.[15]

In gram positive isolates the majority were *Staphylococcus aureus*. Similar results have been seen in other studies by Draz et al., Shaw et al., Mhada et al., and Najeeb et al. [16-19]. In gram negative isolates majority were *Acinetobacter* spp. which was corresponding to studies by Tsering et al and Shrehta et al [5,20]

In our study the majority of gram positive bacterial isolates were least resistant to vancomycin with a resistance of 4%. Similar results were seen in study by Shaw et al. and Najeeb et al.[21,22]. Imipenem showed minimum resistance towards gram negative bacteria with resistance 12% which was in accordance with the study by Jyothi et al[23].

CONCLUSION

Staphylococcus aureus and *Acinetobacter* spp were the majority in our study causing neonatal sepsis. Antimicrobial surveillance of neonatal septicaemia is required to know the antibiotic sensitivity pattern. . Substantially, strengthening of antenatal screening of mothers, prenatal care of newborns and interventions of babies born with complications are the key elements to control the problem. Regular surveillance of local antimicrobial resistance and review of

antibiotic guidelines in the neonatal unit should be maintained. Also, an antibiotic policy should be formulated in the hospital. Depending on the antibiotic sensitivity pattern of the isolates, antibiotics should be used to avoid the dangers of indiscriminate use of antibiotics.

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