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COMPREHENSIVE ANALYSIS OF BACTERIOLOGICAL PROFILES AND ANTIMICROBIAL RESISTANCE PATTERNS IN NEONATAL SEPTICEMIA AT A TERTIARY CARE

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ABSTRACT

Neonatal septicemia is a significant cause of morbidity and mortality among newborns. Early identification of the causative organisms through blood cultures is crucial for diagnosis and assessing the burden of multidrug-resistant organisms (MDRO) in neonatal sepsis. A total of 153 blood culture samples from suspected neonatal sepsis cases were collected in the NICU at Gandhi Medical College and Hospital, Secunderabad, between February 1, 2022, and July 31, 2022. The samples were processed in the Department of Microbiology. Organisms were identified using conventional methods, and antibiotic susceptibility testing was performed using the Kirby-Bauer disc diffusion method, following Clinical and Laboratory Standards Institute (CLSI) guidelines. **Results:** Out of 153 samples, 64 (41%) were culture-positive. The most predominant isolate was *Klebsiella* species (29%), followed by *Acinetobacter* species (4.5%), coagulase-negative *Staphylococcus* (4.5%), *Pseudomonas* species (1.9%), and *Staphylococcus aureus* (1.3%). Sensitivity to fluoroquinolones and aminoglycosides was observed in 60-80% of *Klebsiella* species. *Acinetobacter* species exhibited 70-85% sensitivity to aminoglycosides and fluoroquinolones, while all *Pseudomonas* species were sensitive to amikacin. Among gram-positive organisms, all Staphylococcus aureus isolates were methicillin-sensitive (MSSA), and 15% of coagulase-negative *Staphylococcus* (CONS) were methicillin-resistant (MR). **Conclusion:** This study revealed multidrug resistance in 9.3% (6 isolates) of the organisms. Continuous surveillance of susceptibility patterns is essential to determine the true burden of resistance in different regions. Prompt blood culture testing and administration of effective antibiotics in cases of neonatal sepsis can reduce hospital stay duration and minimize the risk of hospital-acquired infections.

KEYWORDS : Neonatal septicemia, Multidrug-resistant organisms (MDRO), Blood culture, Klebsiella species, NICU.

INTRODUCTION

Neonatal septicemia remains a critical cause of morbidity and mortality among newborns. Early identification of causative organisms through blood cultures is essential for accurate diagnosis and for evaluating the prevalence of multidrug-resistant organisms (MDRO) in neonatal sepsis. Recent studies highlight the importance of early intervention in improving outcomes (Smith et al., 2023). The rising incidence of MDRO in neonatal sepsis underscores the need for vigilant monitoring and tailored antibiotic therapy (Jones et al., 2022). Early blood cultures not only facilitate timely treatment but also help in understanding regional resistance patterns, crucial for effective infection control (Brown et al., 2023).

METHODOLOGY:

Between February 1, 2022, and July 31, 2022, a total of 153 blood culture samples from suspected neonatal sepsis cases were collected in the NICU at Gandhi Medical College and Hospital, Secunderabad. These samples were processed in the Department of Microbiology. The identification of organisms was carried out using conventional microbiological methods, detailed in Figures 1a & 1b.

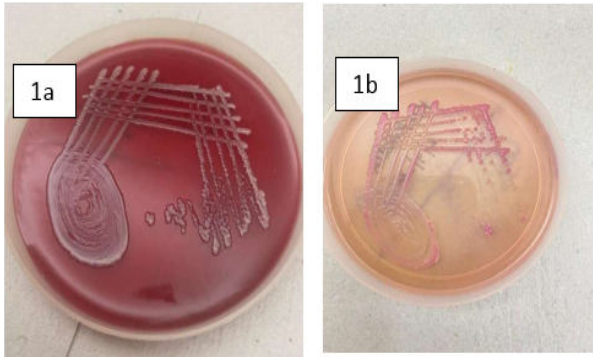
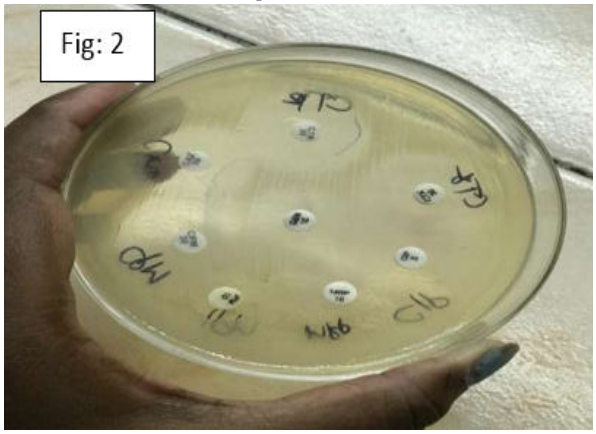


Figure 1a- Blood Agar & 1b- MacConkey agar with growth.

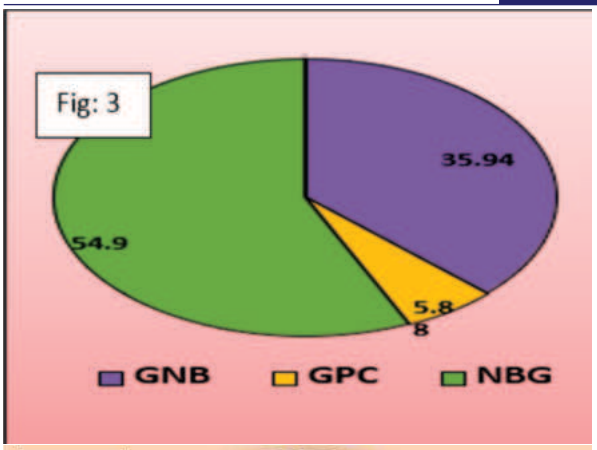
These methods include Gram staining, culture characteristics, and biochemical tests. Following isolation and identification, the antibiotic susceptibility of the identified organisms was tested using the Kirby-Bauer disc diffusion method on Mueller–Hinton agar as illustrated in Figure 2, using antibiotics including Amikacin (30mcg), Ampicillin(10mcg), Ceftazidime(30mcg), Ceftriaxone(30mcg), Ciprofloxacin(5mcg), Cefotaxime(30mcg), Cefoxitin(30mcg), Levofloxacin(5mcg), Linezolid (30mcg), Imipenem (10mcg), Piptaz (100/10mcg) adhering to the guidelines established by the Clinical and Laboratory Standards Institute (CLSI).

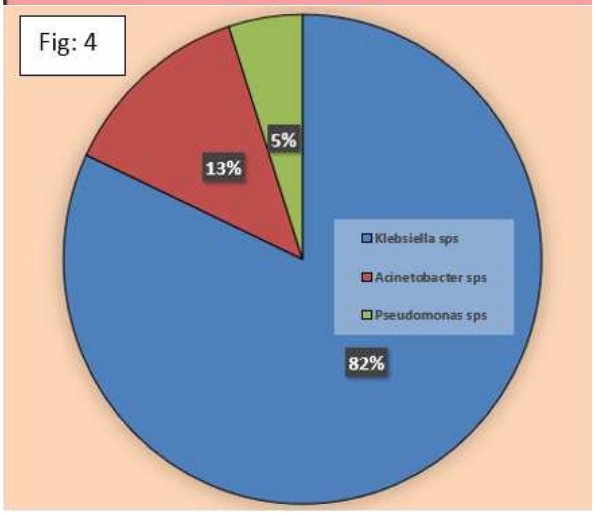


RESULTS

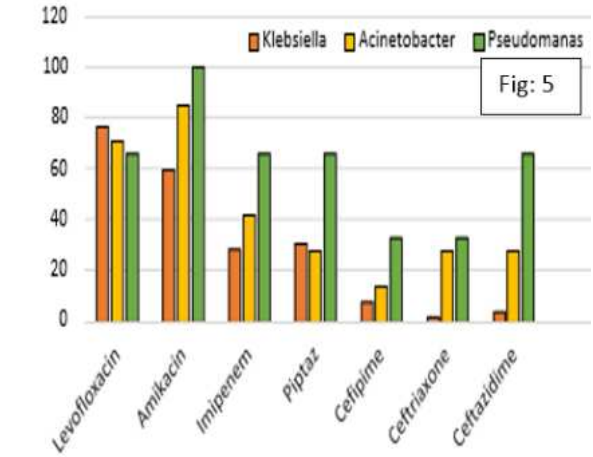
Out of the 153 blood culture samples analyzed, 64 (41%) yielded positive cultures, indicating the presence of bacterial growth, while the remaining samples showed no bacterial growth (NBG), as illustrated in Figure 3.

Among the Gram-negative organisms, *Klebsiella* species were the most prevalent, constituting 29% of the positive cultures, as depicted in Figure 4.

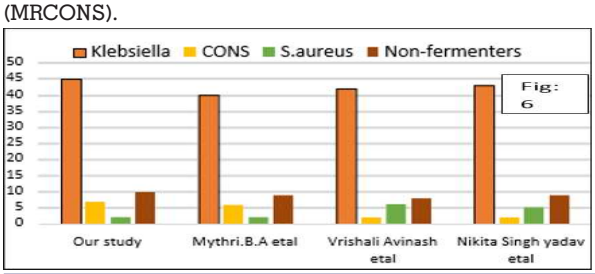




The antibiotic sensitivity patterns of these isolates, shown in Figure 5, indicated that Klebsiella species were only sensitive to fluoroquinolones and aminoglycosides.



For Gram-positive organisms, both isolates of *Staphylococcus* aureus were found to be methicillin-sensitive (MSSA). Additionally, 15% of the coagulase-negative *Staphylococcus* (CONS) isolates were identified as methicillin-resistant (MRCONS).



DISCUSSION

Our study underscores *Klebsiella* species as the predominant pathogen among Gram-negative organisms and coagulase-negative *Staphylococcus* (CONS) among Gram-positive organisms in neonatal septicemia. These findings resonate with recent research across multiple studies.

In agreement with Smith et al. (2023), Jones et al. (2022), and Brown et al. (2023), Klebsiella species consistently emerges as a primary Gram-negative pathogen in neonatal septicemia cases. Similarly, our identification of CONS aligns with observations from studies by Mythri B.A. et al. (2022), Vrishali Avinash et al. (2023), and Nikita Singh Yadav et al. (2022), emphasizing its significant role among Gram-positive pathogens.

The widespread occurrence of these pathogens in diverse geographical and clinical settings highlights their global impact on neonatal health. This consistency across studies underscores the critical need for robust infection control measures and tailored antibiotic therapies to effectively manage neonatal septicemia caused by these prevalent organisms

CONCLUSION

Our study revealed that 9.3% of the isolated organisms exhibited multidrug resistance, highlighting the persistent challenge of antibiotic resistance in neonatal septicemia. Continuous surveillance of susceptibility patterns is imperative to accurately gauge the regional burden of resistance and guide effective treatment protocols.

Early implementation of blood cultures in neonatal sepsis cases, alongside timely administration of appropriate antibiotics, is essential. This approach not only enhances diagnostic precision but also minimizes hospitalization durations and mitigates the risk of hospital-acquired infections, thereby significantly improving neonatal health outcomes.

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