

PREVALENCE AND ANTIBIOGRAM OF NEONATAL SEPTICEMIA ISOLATES IN A TERTIARY CARE SETTING

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ABSTRACT:

Background: Neonatal septicemia remains a significant cause of morbidity and mortality in developing countries. Understanding the bacteriological profile and antibiotic susceptibility patterns is crucial for effective treatment. **Objective:** To determine the bacteriological profile and antibiotic susceptibility patterns of neonatal septicemia cases at NIMS, Jaipur. **Materials and Methods:** A prospective study was conducted. Blood samples from 150 neonates with suspected septicemia were cultured, and isolates were identified using standard microbiological techniques. Antibiotic susceptibility was tested via the Kirby-Bauer method. **Results:** Of 150 samples, 60 (40%) were culture-positive. *Klebsiella pneumoniae* (35%) and *Staphylococcus aureus* (25%) were predominant. Most isolates showed resistance to ampicillin but sensitivity to meropenem. Age distribution indicated higher incidence in preterm neonates. **Conclusion:** *Klebsiella pneumoniae* and *Staphylococcus aureus* are major pathogens in neonatal septicemia at NIMS, Jaipur. High resistance to common antibiotics necessitates updated treatment protocols.

Keywords: Neonatal septicemia, bacteriological profile, antibiotic susceptibility, *Klebsiella pneumoniae*, *Staphylococcus aureus*.

INTRODUCTION:

Antimicrobial Neonatal septicemia, a systemic bacterial infection in newborns within the first 28 days of life, is a leading cause of neonatal mortality, particularly in developing countries like India (1). The condition is characterized by rapid clinical deterioration if untreated, making early diagnosis and appropriate antibiotic therapy critical (2). The incidence of neonatal septicemia varies globally, with rates in India ranging from 15 to 30 per 1,000 live births (3). Predominant pathogens include Gram-negative bacilli like *Klebsiella pneumoniae* and Gram-positive cocci such as *Staphylococcus aureus*, though regional variations exist (4). These organisms often

originate from the maternal genital tract, hospital environment, or community-acquired sources (5).

Antibiotic resistance is a growing concern, complicating treatment and increasing mortality rates (6). In India, multidrug-resistant organisms are increasingly reported due to overuse of broad-spectrum antibiotics and poor infection control practices (7). Studies have shown that pathogens like *Klebsiella pneumoniae* exhibit resistance to commonly used antibiotics such as ampicillin and gentamicin, necessitating the use of higher-generation drugs like carbapenems (8). The choice of empirical antibiotics depends on

local bacteriological profiles and susceptibility patterns, which vary across institutions (9). At NIMS, Jaipur, a tertiary care hospital, neonatal septicemia poses a significant challenge due to high patient load and limited resources.

This study aims to identify the bacteriological profile and antibiotic susceptibility patterns of neonatal septicemia cases at NIMS, Jaipur, to guide effective treatment strategies. Understanding these patterns is essential for reducing neonatal mortality and combating antibiotic resistance. Previous studies from India highlight the dominance of Gram-negative organisms and increasing resistance, underscoring the need for region-specific data (10). By analyzing blood culture isolates and their susceptibility, this study seeks to provide insights into the current microbial landscape and inform evidence-based antibiotic policies. The findings could help clinicians optimize empirical therapy, improve outcomes, and address the growing threat of antimicrobial resistance in neonatal care.

MATERIALS AND METHODS

A prospective study was conducted at the Neonatal Intensive Care Unit (NICU) of National Institute of Medical Sciences and Research, (NIMS University) Jaipur, during one year. Neonates (≤ 28 days) with clinical signs of septicemia, such as fever, lethargy, poor feeding, or respiratory distress, were included. A total of 150 neonates were enrolled after obtaining parental consent. Ethical approval was obtained from the institutional review board.

Blood samples (1–2 mL) were collected aseptically and inoculated into brain heart infusion broth. Cultures were incubated at 37°C for 7 days, with subcultures on blood agar and

MacConkey agar at 24, 48, and 72 hours. Positive cultures were identified using standard biochemical tests, including Gram staining, catalase, oxidase, and coagulase tests. Antibiotic susceptibility was determined by the Kirby-Bauer disk diffusion method on Mueller-Hinton agar, following Clinical and Laboratory Standards Institute (CLSI) guidelines. Antibiotics tested included ampicillin, gentamicin, cefotaxime, amikacin, ciprofloxacin, and meropenem.

Data on age, gender, and clinical outcomes were recorded. Isolates were categorized as early-onset (EOS, <72 hours) or late-onset (LOS, >72 hours) septicemia. Statistical analysis was performed using SPSS version 20, with results expressed as percentages and means.

RESULTS

Of 150 blood samples, 60 (40%) were culture-positive.

Table 1: Bacteriological Profile of Isolates

Organism	Number of Isolates	Percentage (%)
Klebsiella pneumoniae	21	35
Staphylococcus aureus	15	25
Escherichia coli	12	20
Pseudomonas aeruginosa	9	15
Others	3	5

Klebsiella pneumoniae was the most common pathogen (35%), followed by *Staphylococcus aureus* (25%). Gram-negative organisms dominated (70%), reflecting their prevalence in hospital settings. The high incidence of *Klebsiella* suggests environmental or nosocomial sources.

Table 2: Antibiotic Susceptibility Patterns

Antibiotic	K. pneumoniae (%)	S. aureus (%)	E. coli (%)	P. aeruginosa (%)
Ampicillin	10	20	15	10
Gentamicin	30	40	35	25
Cefotaxime	40	50	45	30
Amikacin	60	70	65	55
Ciprofloxacin	50	60	55	50
Meropenem	90	85	80	75

Most isolates showed high resistance to ampicillin (80–90%) and gentamicin (60–75%). Meropenem exhibited the highest susceptibility (75–90%), indicating its efficacy against multidrug-resistant strains.

Late-onset septicemia (60%) was more common, with *Klebsiella pneumoniae* as the leading pathogen, suggesting nosocomial transmission.

Early-onset cases were primarily associated with *Staphylococcus aureus*, likely of maternal origin

Table 3: Distribution of Early- and Late-Onset Septicemia

Type	Number of Cases	Percentage (%)	Predominant Organism
EOS (<72 hrs)	24	40	<i>S. aureus</i>
LOS (>72 hrs)	36	60	<i>K. pneumoniae</i>

DISCUSSION

The study identifies *Klebsiella pneumoniae* and *Staphylococcus aureus* as the primary pathogens in neonatal septicemia at NIMS, Jaipur, corroborating findings from other Indian tertiary care centers (1, 4). The 40% culture positivity rate is consistent with reports highlighting nosocomial infections in resource-constrained NICUs with limited infection control measures (7, 11). Gram-negative organisms, particularly *Klebsiella*, dominated (70%), reflecting their environmental persistence and resistance potential, as noted in prior studies (8, 12). The prevalence of *Klebsiella* in late-onset septicemia (LOS) strongly suggests hospital-acquired infections, necessitating robust hygiene protocols (9, 13, 21).

High resistance to ampicillin (80–90%) and gentamicin (60–75%) aligns with global trends of multidrug-resistant pathogens, driven by widespread antibiotic misuse (6, 14, 22).

Meropenem's high susceptibility (75–90%) supports its role as a critical antibiotic, though its overuse risks further resistance, as warned in earlier research (10, 15, 23). Amikacin and ciprofloxacin remain viable options, but their efficacy varies regionally, underscoring the need for local susceptibility data (5, 16, 24). The increased susceptibility of preterm neonates, as shown in Figure 1, is consistent with studies linking immature immunity to higher septicemia risk (3, 17, 25).

Compared to earlier reports, the resistance patterns at NIMS are alarming, with ampicillin nearly ineffective (2, 18, 26). This calls for revising empirical therapy guidelines, potentially incorporating meropenem or combination therapies, as suggested by previous studies (8, 19, 27). Routine blood cultures and susceptibility testing are essential for tailored treatment to reduce mortality (1, 20, 28). Future research should investigate molecular resistance mechanisms and strengthen infection control to curb multidrug-resistant strains (7, 12, 29). Implementing antibiotic stewardship and enhanced surveillance is critical to address the escalating threat of antimicrobial resistance in neonatal care (30).

The study was conducted at a single center, limiting its generalizability. The sample size (150) may not fully represent regional variations. Molecular techniques for resistance profiling were not employed due to resource constraints, potentially missing specific resistance genes. Contamination risks during blood collection could have affected culture results. Follow-up data on treatment outcomes were not included, restricting insights into clinical efficacy.

CONCLUSION

Klebsiella pneumoniae and *Staphylococcus aureus* are the leading causes of neonatal septicemia at NIMS, Jaipur, with high resistance to ampicillin and gentamicin. Meropenem remains effective, but its judicious use is crucial. Routine blood cultures and local susceptibility data should guide empirical therapy to improve outcomes and combat antibiotic resistance.

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