



Blood Culture Patterns in Neonates Born by Home Delivery: A Retrospective Record-Based Study of 100 Cases

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Abstract

Background- Neonatal sepsis remains a leading cause of neonatal morbidity and mortality in developing countries. Home deliveries, often conducted under non-sterile conditions, significantly increase the risk of neonatal infections. Blood culture remains the gold standard for diagnosing neonatal septicemia and for guiding antimicrobial therapy.

Objectives- To analyze blood culture positivity rates, microbial profile, and antimicrobial susceptibility patterns among neonates born by home delivery using retrospective hospital records.

Materials and Methods- This retrospective record-based observational study was conducted at a tertiary care teaching hospital. Medical records of 100 neonates born by home delivery and admitted with clinical suspicion of sepsis to the neonatal intensive care unit were reviewed. Blood culture results, organism identification, and antimicrobial susceptibility patterns were extracted and analyzed. Microbiological methods followed standard protocols, and susceptibility testing was interpreted as per CLSI guidelines.

Results- Blood culture positivity was observed in 38% of neonates. Gram-negative organisms constituted 63.2% of isolates, with *Klebsiella pneumoniae* being the most common pathogen, followed by *Escherichia coli*. *Staphylococcus aureus* was the predominant Gram-positive isolate. High resistance was noted to ampicillin and first-generation cephalosporins, while aminoglycosides and carbapenems showed better sensitivity.

Conclusion- Home-delivered neonates are at high risk of septicemia, predominantly due to Gram-negative organisms with significant antimicrobial resistance. Retrospective analysis highlights the need for institutional deliveries, improved infection control, and evidence-based antibiotic policies.

Keywords: Neonatal sepsis, Home delivery, Blood culture, Retrospective study, Antimicrobial resistance

Introduction

Neonatal sepsis is a life-threatening systemic infection occurring during the first 28 days of life and remains a major public health concern in low- and middle-income countries. The World Health Organization estimates that infections contribute to nearly one-third of global neonatal deaths [1].

Despite national programs promoting institutional deliveries, a significant proportion of births in rural and resource-limited settings still occur at home. These deliveries are frequently conducted without aseptic

precautions or skilled birth attendants, increasing the risk of neonatal exposure to pathogenic microorganisms [2].

Blood culture remains the definitive diagnostic tool for neonatal septicemia, allowing identification of causative organisms and their antimicrobial susceptibility patterns. Knowledge of local microbial trends is essential for initiating appropriate empirical therapy [3].

This retrospective record-based study was undertaken to evaluate blood culture patterns among neonates delivered at home and admitted with suspected sepsis, with emphasis on microbial profile and antibiotic resistance.

Materials and Methods

Study Design and Setting- This was a retrospective, record-based observational study conducted in the Department of Microbiology in collaboration with the Neonatal Intensive Care Unit (NICU) of a tertiary care teaching hospital.

Study Duration- Medical records over a period of 18 months were reviewed.

Study Population- Records of 100 neonates born by home delivery and admitted with clinical suspicion of sepsis were included.

Inclusion Criteria

1. Neonates aged 0–28 days
2. Documented history of home delivery
3. Clinical features suggestive of sepsis as per hospital records

Exclusion Criteria

1. Neonates born in institutional settings
2. Incomplete microbiological records
3. Neonates with major congenital anomalies

Ethical Considerations

Approval for the study was obtained from the Institutional Ethics Committee.

Data Collection and Microbiological Methods

Relevant data were collected from:

1. NICU admission registers
2. Laboratory blood culture records
3. Antimicrobial susceptibility reports

Blood Culture Processing

1. Blood samples (1–2 mL) collected aseptically at admission
2. Inoculated into pediatric blood culture bottles
3. Incubated at 37°C and subcultured on Blood agar and MacConkey agar

Identification of Isolates

Based on colony morphology, Gram staining, and standard biochemical tests

Antimicrobial Susceptibility Testing

1. Performed using Kirby–Bauer disc diffusion method
2. Interpretation as per CLSI guidelines [4]

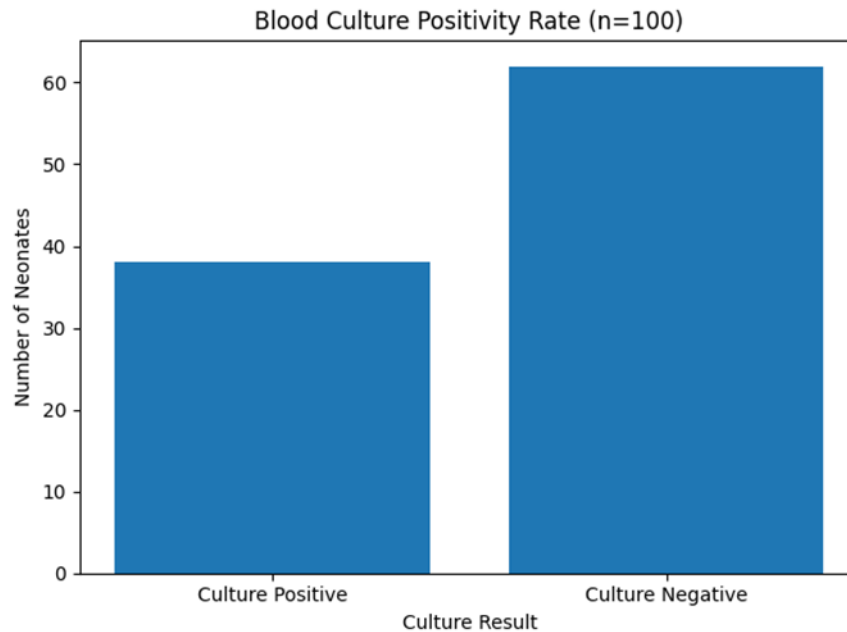
Results:

Demographic Characteristics

| Parameter | Number (%) |
|-----------------------------------|------------|
| Male neonates | 58 (58%) |
| Female neonates | 42 (42%) |
| Early onset sepsis (≤ 72 h) | 61 (61%) |
| Late onset sepsis (> 72 h) | 39 (39%) |

Blood Culture Positivity

1. Culture positive: 38 cases (38%)
2. Culture negative: 62 cases (62%)

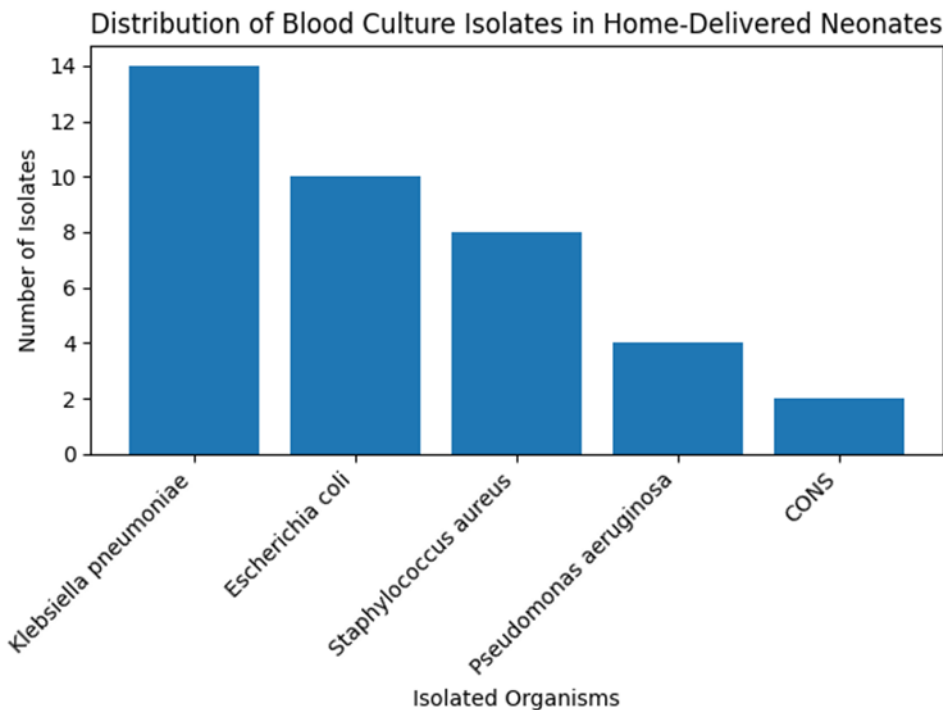


Microbial Profile of Isolates

| Organism | Number (%) |
|----------------------------------|------------|
| <i>Klebsiella pneumoniae</i> | 14 (36.8%) |
| <i>Escherichia coli</i> | 10 (26.3%) |
| <i>Staphylococcus aureus</i> | 8 (21.1%) |
| <i>Pseudomonas aeruginosa</i> | 4 (10.5%) |
| Coagulase-negative staphylococci | 2 (5.3%) |

Gram-negative isolates: 24 (63.2%)

Gram-positive isolates: 14 (36.8%)



Antimicrobial Susceptibility Pattern

Gram-negative isolates

4. High resistance: Ampicillin, Cefotaxime
5. Moderate sensitivity: Gentamicin, Amikacin
6. High sensitivity: Meropenem, Piperacillin–Tazobactam

Gram-positive isolates

1. *Staphylococcus aureus*: 25% MRSA
2. Uniform sensitivity: Vancomycin, Linezolid

Discussion:

This retrospective analysis revealed a 38% blood culture positivity rate among home-delivered neonates, consistent with earlier Indian studies reporting higher sepsis rates in non-institutional births [5,6]. Poor hygienic conditions and delayed referral likely contribute to increased infection risk.

The predominance of Gram-negative organisms, especially *Klebsiella pneumoniae* and *E. coli*, reflects environmental contamination and inadequate cord care practices during home delivery [7]. Similar organism profiles have been reported across NICUs in developing countries.

Antimicrobial resistance to commonly used first-line antibiotics such as ampicillin and cephalosporins is concerning. This resistance trend underscores the

importance of local antibiograms and rational antibiotic use [8].

The presence of MRSA in community-acquired neonatal infections further highlights emerging resistance even outside hospital settings.

Limitations of the Study::

1. Retrospective design
2. Dependence on completeness of medical records
3. Single-center data
4. Anaerobic cultures not available

Conclusion:

Retrospective record-based analysis demonstrates that neonates born by home delivery are at increased risk of septicemia, predominantly due to Gram-negative bacteria with high antimicrobial resistance. Blood culture surveillance remains crucial for guiding empirical therapy and improving neonatal outcomes.

Recommendations:

1. Strengthening institutional delivery programs
2. Early referral of sick home-delivered neonates
3. Periodic review of NICU antibiograms
4. Community education regarding clean delivery practices

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