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## NEONATAL SEPSIS: CURRENT CONCEPTS IN DIAGNOSIS AND MANAGEMENT

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### ABSTRACT

Neonatal sepsis remains a major cause of morbidity and mortality worldwide, particularly in low- and middle-income countries. Despite advances in neonatal intensive care, early diagnosis is challenging due to nonspecific clinical features and limitations of laboratory tests. Emerging diagnostic biomarkers, antimicrobial stewardship strategies, and infection-prevention practices have significantly influenced outcomes. This review discusses epidemiology, pathogenesis, clinical presentation, diagnostic approaches, current management strategies, and preventive measures in neonatal sepsis<sup>1</sup>.

**KEYWORDS-** Neonatal sepsis, Neonatal infection, Neonatal morbidity and mortality

### INTRODUCTION

Neonatal sepsis is a systemic infection occurring in infants within the first 28 days of life. It may present as bacteremia, pneumonia, meningitis, or disseminated infection. According to the World Health Organization, neonatal infections are among the leading causes of neonatal deaths globally, especially in preterm and low-birth-weight infants.

Sepsis in neonates is broadly classified into: Early-Onset Sepsis (EOS): Occurring within 72 hours of birth (some define up to 7 days).

Late-Onset Sepsis (LOS): Occurring after 72 hours of life<sup>2</sup>.

### AIMS AND OBJECTIVES

To review the current understanding of neonatal sepsis, risk factors and pathophysiology and current management strategies.

To identify major maternal and neonatal risk factors contributing to the development of sepsis in newborns.

### MATERIALS & METHODS

Relevant data collected from Modern text book, journals, website, articles etc.

## CAUSES OF FEMALE INFERTILITY <sup>4</sup>

### Epidemiology

Higher incidence in preterm and very low birth weight (VLBW) infants. EOS is often associated with maternal risk factors. LOS is frequently related to hospital-acquired infections. Mortality is significantly higher in extremely preterm neonates.

Common pathogens vary geographically:

- EOS: Group B Streptococcus, E. coli, Listeria.
- LOS: Coagulase-negative staphylococci, Klebsiella, Pseudomonas, Candida<sup>3</sup>.

### Risk Factors

- Maternal Risk Factors (EOS)
  - Prolonged rupture of membranes (>18 hours)
  - Maternal fever
  - Chorioamnionitis
  - Urinary tract infection during pregnancy
  - Preterm labor
- Neonatal Risk Factors
  - Prematurity
  - Low birth weight
  - Birth asphyxia
  - Invasive procedures (ventilation, central lines)
  - Total parenteral nutrition<sup>4</sup>.

### Pathogenesis

- Neonates have immature immune systems characterized by:
  - Reduced neutrophil storage pool
  - Impaired complement activity
  - Decreased immunoglobulin levels (especially in preterm infants)
- In EOS, organisms are usually transmitted vertically from the maternal genital tract. In LOS, infection is commonly acquired from the hospital environment or caregivers. The inflammatory cascade involves cytokines (IL-6, TNF- $\alpha$ ), leading to systemic inflammatory response syndrome (SIRS), endothelial dysfunction, and potential multiorgan failure<sup>5</sup>.

### Clinical Presentation

Symptoms are often subtle and nonspecific:

- General Signs
- Lethargy
- Poor feeding
- Temperature instability
- Irritability

- Respiratory Apnea
- Tachypnea
- Grunting
- Cardiovascular
- Hypotension
- Poor perfusion
- Shock
- Gastrointestinal-Abdominal distension
- Vomiting
- Neurological signs may include seizures or altered sensorium in meningitis<sup>6</sup>.

## Diagnosis

### A. Clinical Suspicion

High index of suspicion is essential, particularly in at-risk neonates.

### B. Laboratory Investigations

1. Blood Culture is Gold standard Ideally collected before starting antibiotics it requires adequate blood volume.

2. Sepsis Screen

- Total leukocyte count
- Absolute neutrophil count
- Immature-to-total neutrophil ratio
- C-reactive protein (CRP)
- Micro-ESR

3. Biomarkers

- a) Procalcitonin (PCT)
- b) Interleukin-6
- c) Presepsin (emerging marker)

4. Lumbar Puncture

Recommended if meningitis suspected or blood culture positive

5. Advanced Diagnostics

- a) Polymerase chain reaction (PCR)
- b) Multiplex molecular panels
- c) No single test is definitive; diagnosis is clinical plus laboratory correlation<sup>7</sup>.

## Management

### A. Initial Stabilization

- i. Airway management
- ii. Oxygen supplementation
- iii. IV fluids (judicious boluses in shock)
- iv. Inotropic support if needed

### B. Empirical Antibiotic Therapy

- a) Choice depends on local antibiogram patterns.
- b) Common Empirical Regimens:
- c) Ampicillin + Gentamicin (EOS)
- d) Vancomycin + Aminoglycoside / Third-generation cephalosporin (LOS in NICU)
- e) Antibiotics should be modified based on culture sensitivity results.
- f) Duration:
- g) 7–10 days (culture-proven sepsis without meningitis)
- h) 14–21 days (meningitis)

### C. Supportive Care

- a) Temperature regulation
- b) Glycemic control
- c) Electrolyte balance
- d) Mechanical ventilation if required

### D. Antifungal Therapy

- a) Consider in VLBW infants with risk factors or persistent sepsis<sup>8</sup>.
- b) Antimicrobial Stewardship
- c) Overuse of broad-spectrum antibiotics leads to resistance.

Strategies include:

- a) Strict culture-guided therapy
- b) Early discontinuation if cultures are negative and infant is stable, unit-based antibiotic policy. Guidelines from organizations such as the Indian Academy of Pediatrics emphasize rational antibiotic use<sup>9</sup>.

## Prevention

- i. Maternal Measures
- ii. Screening and intrapartum prophylaxis for GBS
- iii. Clean delivery practices
- iv. Treatment of maternal infections
- v. NICU Measures
- vi. Hand hygiene
- vii. Central line care bundles
- viii. Exclusive breastfeeding
- ix. Kangaroo mother care

- x.Minimal invasive procedures
- xi.Infection control protocols significantly reduce LOS<sup>10</sup>.

## Prognosis

Prognosis depends on:

- i.Birth weight
- ii.Gestational age
- iii.Organism involved
- iv.Timely initiation of treatment
- v.Complications include:
- vi.Neurodevelopmental delay
- vii.Hearing impairment
- viii.Chronic lung disease<sup>11</sup>.

## Recent Advances

- Rapid molecular diagnostics
- Sepsis risk calculators
- Biomarker-guided antibiotic discontinuation
- Probiotics for prevention in preterm neonates
- Research continues to focus on early detection and targeted therapy<sup>12</sup>.

## Conclusion

Neonatal sepsis remains a critical challenge in neonatal care. Early recognition, prompt empirical therapy, supportive management, and strict infection control practices are essential to improve survival. Rational antibiotic use and implementation of preventive strategies can significantly reduce disease burden. Future advances in rapid diagnostics and immune-modulatory therapies may further improve outcome.

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