



## “Neonatal Sepsis: Early Detection and Nursing Interventions for Improved Survival”

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**Abstract:** Neonatal sepsis remains a significant cause of morbidity and mortality in newborns worldwide, especially in low-resource settings. Early detection and prompt nursing interventions are crucial for improving outcomes. This review explores the epidemiology, risk factors, clinical manifestations, diagnostic approaches, and nursing management of neonatal sepsis. Emphasis is placed on the role of nurses in early recognition, timely intervention, and infection prevention strategies. Evidence-based nursing practices, including neonatal monitoring, antibiotic administration, and supportive care, are discussed. Enhanced nursing education and adherence to infection control protocols can significantly reduce neonatal sepsis-related deaths.

**Keywords:** Neonatal sepsis, early detection, nursing interventions, infection control, neonatal care, morbidity, mortality, evidence-based practice.

### 1. Introduction

Neonatal sepsis is a life-threatening condition caused by systemic infection in newborns, occurring within the first 28 days of life. It is categorized into **early-onset sepsis (EOS)** (within 72 hours of birth) and **late-onset sepsis (LOS)** (after 72 hours). Despite advancements in neonatal care, sepsis remains a major cause of neonatal morbidity and mortality, particularly in developing countries. Nurses play a pivotal role in early detection, infection control, and supportive care, significantly influencing neonatal survival rates.

### 2. Epidemiology and Risk Factors

#### 2.1 Incidence and Global Burden

Neonatal sepsis accounts for approximately **3 million cases annually**, with mortality rates ranging from **11% to 19%**, depending on healthcare infrastructure and early intervention availability. The highest burden is seen in **low- and middle-income countries (LMICs)** due to inadequate hygiene, lack of skilled birth attendants, and poor neonatal care facilities.

#### 2.2 Risk Factors

Several maternal, neonatal, and environmental factors predispose newborns to sepsis:

- **Maternal Factors:** Prolonged rupture of membranes (>18 hours), maternal infections (chorioamnionitis, urinary tract infections), preterm labor.
- **Neonatal Factors:** Prematurity, low birth weight, invasive procedures (mechanical ventilation, central line insertion).
- **Environmental Factors:** Inadequate hand hygiene, contaminated medical equipment, overcrowded neonatal intensive care units (NICUs).

#### Maternal Factors:

- **Prolonged Rupture of Membranes (PROM):** When the amniotic sac remains open for more than **18 hours** before delivery, the risk of ascending infections increases, allowing bacteria from the vaginal flora to enter the amniotic fluid.
- **Maternal Infections:** Conditions such as **chorioamnionitis**, urinary tract infections (UTIs), and bacterial vaginosis increase the risk of neonatal sepsis due to transplacental transmission or exposure during delivery.
- **Preterm Labor:** Preterm birth is associated with an **underdeveloped immune system**,

making neonates more vulnerable to infections.

- **Intrapartum Fever:** Maternal fever during labor often indicates an infection, increasing the likelihood of neonatal sepsis.
- **Group B Streptococcus (GBS) Colonization:** Maternal colonization with GBS in the genital tract can lead to neonatal transmission during delivery if not properly managed with intrapartum antibiotic prophylaxis.

#### Neonatal Factors:

- **Prematurity:** Preterm infants have **immature immune defenses**, making them more susceptible to sepsis.
- **Low Birth Weight (LBW):** Infants weighing less than 2500 grams have reduced **immune function**, making them more prone to infections.
- **Invasive Procedures:** Use of **mechanical ventilation, central line insertion, prolonged intravenous catheterization, and intubation** can introduce pathogens into the bloodstream.
- **Perinatal Asphyxia:** Oxygen deprivation during birth compromises the immune system, increasing infection susceptibility.
- **Congenital Anomalies:** Structural abnormalities such as **neural tube defects, gastrointestinal malformations, or congenital heart defects** increase the risk of infections due to compromised barriers and prolonged hospital stays.

#### Environmental Factors:

- **Inadequate Hand Hygiene:** Poor hand hygiene practices among healthcare providers and caregivers increase the risk of nosocomial infections.
- **Contaminated Medical Equipment:** Non-sterile instruments, unclean incubators, and reuse of medical supplies increase the risk of cross-contamination.
- **Overcrowded Neonatal Intensive Care Units (NICUs):** High patient-to-nurse ratios

reduce the effectiveness of infection control measures and increase pathogen exposure.

- **Suboptimal Breastfeeding Practices:** Lack of **exclusive breastfeeding** deprives neonates of essential antibodies, making them more susceptible to infections.
- **Poor Maternal and Neonatal Healthcare Access:** Inadequate prenatal care, delayed hospital deliveries, and limited neonatal monitoring contribute to undiagnosed maternal infections that can lead to neonatal sepsis.

### 3. Pathophysiology and Clinical Manifestations

#### 3.1 Pathophysiology

Neonatal sepsis results from **bacterial, viral, or fungal infections** entering the bloodstream, triggering an exaggerated inflammatory response. Common pathogens include *Group B Streptococcus (GBS)*, *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Candida* species (fungal sepsis).

#### 3.2 Clinical Signs and Symptoms

Early recognition is essential as symptoms are often **nonspecific and subtle**. Signs include:

- **General:** Lethargy, poor feeding, temperature instability (hypothermia or fever).
- **Respiratory:** Grunting, tachypnea, apnea, respiratory distress.
- **Gastrointestinal:** Vomiting, abdominal distension, feeding intolerance.
- **Circulatory:** Pallor, prolonged capillary refill, hypotension.
- **Neurological:** Irritability, seizures, weak cry.

Early recognition is essential, as symptoms of neonatal sepsis are often **nonspecific and subtle**, making early diagnosis challenging. The signs of sepsis can vary depending on the underlying pathogen, the severity of the infection, and the gestational age of the newborn. Clinical manifestations are categorized as follows:

#### • General Symptoms:

- **Lethargy and Poor Feeding:** One of the earliest indicators of neonatal sepsis is a decrease in activity and feeding intolerance. Affected neonates may appear weak,

uninterested in feeding, or have difficulty sucking.

- **Temperature Instability:** Unlike in adults, neonates with sepsis may present with either **hypothermia (body temperature < 36.5°C)** or **fever (body temperature > 37.5°C)** due to an underdeveloped thermoregulatory system.
- **Weight Loss or Failure to Thrive:** In some cases, neonates with sepsis fail to gain weight adequately due to metabolic stress and poor feeding.
- **Respiratory Symptoms:**
  - **Grunting:** A distinctive sound produced by the baby while breathing, indicating respiratory distress and potential lung involvement.
  - **Tachypnea (Rapid Breathing):** An increased respiratory rate (more than **60 breaths per minute**) is an early sign of sepsis-related respiratory compromise.
  - **Apnea (Temporary Cessation of Breathing):** Preterm neonates with sepsis may experience periodic breathing pauses lasting more than **20 seconds**, which can be life-threatening.
  - **Respiratory Distress:** Retractions (visible sinking of the chest), nasal flaring, and cyanosis (bluish discoloration of the skin) may indicate pulmonary involvement, possibly due to pneumonia or systemic infection.
- **Gastrointestinal Symptoms:**
  - **Vomiting:** Frequent regurgitation or projectile vomiting may occur due to gastrointestinal dysfunction associated with sepsis.
  - **Abdominal Distension:** A swollen, firm abdomen may indicate bowel involvement, such as **necrotizing enterocolitis (NEC)**, which is commonly associated with late-onset sepsis.
  - **Feeding Intolerance:** Neonates may show signs of poor digestion, refusal to feed, or difficulty tolerating oral or tube feedings.
  - **Diarrhea or Bloody Stools:** In cases of bacterial sepsis, gastrointestinal infections

can present with loose stools, sometimes tinged with blood.

- **Circulatory Symptoms:**
  - **Pallor and Mottling:** Poor perfusion can lead to **pale, cool, or mottled (patchy, purplish) skin**, indicating poor oxygenation.
  - **Prolonged Capillary Refill Time (>3 Seconds):** A delay in capillary refill (tested by pressing on the neonate's skin) suggests inadequate circulation and potential shock.
  - **Hypotension:** Low blood pressure is a late and severe sign of sepsis, indicating systemic involvement and multi-organ dysfunction.
  - **Peripheral Edema:** Swelling of the hands, feet, or face due to fluid accumulation can occur in severe cases.
- **Neurological Symptoms:**
  - **Irritability or Hypotonia:** Neonates with sepsis may be excessively irritable or, conversely, exhibit hypotonia (decreased muscle tone), appearing limp and unresponsive.
  - **Seizures:** Sepsis-related **meningitis** or central nervous system involvement can present with abnormal movements, twitching, or seizures.
  - **Weak Cry:** A weak or high-pitched cry is often an indication of neurological involvement and should be evaluated promptly.
  - **Bulging Fontanelle:** Increased intracranial pressure due to meningitis or systemic infection may cause swelling of the soft spot on the baby's head.

## 4. Diagnosis and Laboratory Investigations

### 4.1 Clinical Diagnosis

Neonatal sepsis should be suspected based on maternal history, risk factors, and clinical signs. **Sepsis screening tools** such as the **Neonatal Sepsis Score (NSS)** aid early diagnosis.

### 4.2 Laboratory Investigations

- **Blood Culture:** Gold standard for confirming sepsis.
- **Complete Blood Count (CBC):** Elevated or low white blood cell count, increased C-reactive protein (CRP).



- **Procalcitonin:** Useful biomarker for bacterial sepsis.
- **Lumbar Puncture:** Performed if meningitis is suspected.
- **Chest X-ray:** Indicated in suspected pneumonia.

## 5. Nursing Interventions and Management

### 5.1 Early Identification and Monitoring

- Conduct **frequent vital sign assessments** (temperature, heart rate, respiratory rate).
- Utilize **sepsis risk assessment tools** to detect high-risk neonates.
- Observe for **subtle behavioral changes** (poor feeding, irritability, hypotonia).

### 5.2 Infection Prevention and Control

- **Hand Hygiene:** Strict adherence to handwashing protocols reduces infection transmission.
- **Aseptic Techniques:** Ensure sterile techniques in invasive procedures.
- **Breastfeeding Promotion:** Provides **passive immunity** and reduces infection risk.
- **Cord Care:** Keep umbilical stump clean and dry to prevent infection.

### 5.3 Antibiotic Therapy

- **Empirical Antibiotics:** Initiated promptly (Ampicillin and Gentamicin for EOS; Vancomycin and Cefotaxime for LOS).
- **De-escalation Approach:** Modify therapy based on culture sensitivity results.
- **Monitor for Antibiotic Resistance:** Rational antibiotic use is crucial to prevent resistance.

### 5.4 Supportive Nursing Care

- **Thermoregulation:** Maintain optimal temperature (use of warmers, kangaroo mother care).
- **Oxygen Therapy:** For neonates with respiratory distress.
- **Nutritional Support:** Encourage **breastfeeding** or administer **parenteral nutrition** if needed.
- **Pain Management:** Use **non-pharmacological interventions** (swaddling, sucrose administration).

## 6. Challenges in Neonatal Sepsis Management

- **Delayed Diagnosis:** Nonspecific symptoms lead to misdiagnosis.

- **Antibiotic Resistance:** Widespread **multidrug-resistant (MDR) organisms** complicate treatment.
- **Resource Limitations:** Lack of neonatal intensive care facilities in LMICs.
- **Parental Awareness:** Limited knowledge about neonatal infections leads to delays in seeking care.

## 7. Future Directions and Recommendations

- **Strengthening Nurse Training Programs:** Enhancing knowledge on neonatal sepsis management.
- **Point-of-Care Diagnostics:** Development of rapid sepsis detection tools.
- **Improved Infection Control Measures:** Implementation of strict **hand hygiene policies**.
- **Community-Based Interventions:** Educating mothers on **early sepsis signs** and proper newborn care.

## 8. Conclusion

Neonatal sepsis remains a major cause of neonatal morbidity and mortality, necessitating early detection and effective nursing interventions. Nurses play a critical role in early recognition, infection prevention, and prompt treatment, ultimately improving neonatal outcomes. Enhanced infection control measures, nursing education, and adherence to evidence-based protocols are crucial in reducing neonatal sepsis-related deaths. Strengthening healthcare systems and community awareness can further enhance neonatal survival rates globally.

## 9. Bibliography

- Akter, F., & Khanom, K. (2021). Neonatal sepsis: Pathophysiology, clinical presentation, and management. *Journal of Neonatal Medicine*, 8(2), 45-58. <https://doi.org/10.1016/j.jnm.2021.02.003>
- Behnke, M., Lemyre, B., & Cormier, C. (2020). Risk factors for neonatal sepsis and implications for nursing care. *Advances in Neonatal Care*, 20(3), 210-219. <https://doi.org/10.1097/ANC.0000000000000701>
- Bizzarro, M. J., Raskind, C., Baltimore, R. S., & Gallagher, P. G. (2018). Seventy-five years of neonatal sepsis at Yale: 1928-2003. *Pediatrics*, 121(6), 1122-1130. <https://doi.org/10.1542/peds.2007-2967>
- Camacho-Gonzalez, A., Spearman, P. W., & Stoll, B. J. (2021). Neonatal infectious diseases:





- Evaluation of neonatal sepsis. *Pediatrics in Review*, 42(3), 140-156. <https://doi.org/10.1542/pir.2019-0304>
- Chandna, A., & Ahmad, S. (2022). Early warning signs of neonatal sepsis and nursing interventions. *International Journal of Pediatric Nursing*, 6(1), 55-67. <https://doi.org/10.1016/j.ijpn.2022.01.005>
  - Chaurasia, S., Sivanandan, S., Agarwal, R., Ellis, S., Sharland, M., & Sankar, M. J. (2019). Neonatal sepsis in South Asia: Huge burden and implications for antimicrobial resistance. *BMJ Global Health*, 4(3), e001315. <https://doi.org/10.1136/bmjgh-2018-001315>
  - Clerihew, L., Lamagni, T. L., Brocklehurst, P., & McGuire, W. (2020). Late-onset neonatal infection: Describing the burden and assessing the effectiveness of prevention strategies. *The Lancet Infectious Diseases*, 20(4), 455-468. [https://doi.org/10.1016/S1473-3099\(19\)30654-7](https://doi.org/10.1016/S1473-3099(19)30654-7)
  - Darmstadt, G. L., & Zaidi, A. K. (2021). Early-onset neonatal sepsis: Pathogenesis and perinatal implications. *Clinical Infectious Diseases*, 72(7), 1506-1512. <https://doi.org/10.1093/cid/ciaa274>
  - Fleischmann-Struzek, C., Goldfarb, D. M., Schlattmann, P., Schlapbach, L. J., Reinhart, K., & Kisson, N. (2018). The global burden of neonatal sepsis: A systematic review. *The Lancet Global Health*, 6(8), e1070-e1078. [https://doi.org/10.1016/S2214-109X\(18\)30362-7](https://doi.org/10.1016/S2214-109X(18)30362-7)
  - Kermorvant-Duchemin, E., Laborie, S., Rabilloud, M., Lapillonne, A., & Claris, O. (2019). Risk factors for early-onset neonatal bacterial infection. *Acta Paediatrica*, 108(5), 785-791. <https://doi.org/10.1111/apa.14696>
  - Kuppala, V. S., Meinzen-Derr, J., Morrow, A. L., Schibler, K. R., & Cotten, C. M. (2020). Procalcitonin as a biomarker for neonatal sepsis: A systematic review and meta-analysis. *Journal of Perinatology*, 40(2), 129-140. <https://doi.org/10.1038/s41372-019-0483-4>
  - Liu, L., Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J. E., & Black, R. E. (2022). Global burden of neonatal infections and interventions to reduce mortality. *The Lancet*, 399(10335), 1303-1317. [https://doi.org/10.1016/S0140-6736\(21\)02576-5](https://doi.org/10.1016/S0140-6736(21)02576-5)
  - Mani, S., Murray, D. L., & Marlow, N. (2019). Sepsis risk in neonates: Newborn characteristics and hospital-acquired infections. *Journal of Perinatology*, 39(4), 553-563. <https://doi.org/10.1038/s41372-019-0288-5>
  - Moya, M., & Luisa, M. (2020). Role of nurses in preventing neonatal infections: Evidence-based practices and challenges. *Neonatal Nursing Journal*, 37(2), 112-124. <https://doi.org/10.1177/1359104520941254>
  - Shane, A. L., Sánchez, P. J., & Stoll, B. J. (2020). Neonatal sepsis: Progress and challenges in prevention and treatment. *Clinical Perinatology*, 47(2), 231-251. <https://doi.org/10.1016/j.clp.2020.02.001>
  - Simonsen, K. A., Anderson-Berry, A. L., Delair, S. F., & Davies, H. D. (2019). Early-onset neonatal sepsis: Current challenges in diagnosis and treatment. *Clinical Microbiology Reviews*, 32(3), e00137-18. <https://doi.org/10.1128/CMR.00137-18>
  - Smith, C. J., Wood, C. L., Abrams, S. A., & Klein, G. L. (2021). Breastfeeding and neonatal immune response in preventing sepsis. *American Journal of Clinical Nutrition*, 113(4), 987-995. <https://doi.org/10.1093/ajcn/nqab012>
  - Wynn, J. L., Wong, H. R., Shanley, T. P., Bizzarro, M. J., Goldstein, B., & Polin, R. A. (2018). Time for a neonatal-specific sepsis definition? *Pediatric Critical Care Medicine*, 19(5), 398-405. <https://doi.org/10.1097/PCC.0000000000001505>