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Review Article

Utility of Sepsis Screen in Screening Probable Sepsis in Neonates at a Tertiary Care Centre

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Abstract

Sepsis remains a leading cause of morbidity and mortality in neonates, with early identification being critical for successful treatment outcomes. This study evaluates the utility of a sepsis screen as a diagnostic tool for detecting probable sepsis in neonates admitted to a tertiary care center. A prospective observational study was conducted over 12 months, focusing on neonates presenting with signs and symptoms suggestive of sepsis. Sensitivity, specificity, and predictive values of the sepsis screen in diagnosing neonatal sepsis were assessed. The findings indicate that while the sepsis screen is a valuable initial diagnostic tool, its standalone utility is limited and should be complemented by clinical judgment and advanced microbiological investigations.

Keywords: neonatal sepsis; sepsis screen; early diagnosis; tertiary care; predictive value; neonates

Introduction

Neonatal sepsis is a potentially fatal condition caused by bacterial, viral, or fungal infections and is characterized by systemic inflammation and multi-organ dysfunction. Despite advancements in neonatal care, it remains a significant contributor to neonatal mortality globally. Early diagnosis and treatment are critical to reducing morbidity and mortality, necessitating the identification of reliable diagnostic markers in clinical practice.Neonatal sepsis is classified into early-onset sepsis (EOS), occurring within the first 72 hours of life, and late-onset sepsis (LOS), presenting after 72 hours. EOS is typically associated with vertical transmission of pathogens from the mother, whereas LOS is often linked to nosocomial infections. The nonspecific clinical presentation of sepsis—including lethargy, poor feeding, respiratory distress, and temperature instability—renders its diagnosis particularly challenging. The sepsis screen, a panel of laboratory tests including complete blood count (CBC), C-reactive protein (CRP), blood cultures, and immature to total neutrophil ratio (I/T ratio), is widely used for initial evaluation. However, its diagnostic accuracy and role in guiding clinical decisions require further validation. This study aims to assess the utility of the sepsis screen in detecting probable sepsis in neonates admitted to a tertiary care center, emphasizing its sensitivity, specificity, and predictive values compared to the gold standard of blood culture results.

Methodology:

Study Design

A prospective observational study was conducted at a tertiary care neonatal unit over 12 months (January 2023 to December 2023). The study received approval from the institutional ethics committee

Study Population Inclusion **criteria:**

- Neonates aged 0–28 days presenting with clinical signs of sepsis, such as fever, hypothermia, tachycardia, bradycardia, respiratory distress, poor feeding, lethargy, or abnormal cry.
- Neonates admitted to the neonatal intensive care unit (NICU) with suspected sepsis based on the attending physician's clinical judgment.

Exclusion criteria:

- Neonates with known congenital anomalies or metabolic disorders.
- Neonates with confirmed non-infectious conditions mimicking sepsis (e.g., hypoxic- ischemic encephalopathy, perinatal asphyxia).
- Neonates previously exposed to broad-spectrum antibiotics.

Diagnostic Approach

All neonates presenting with suspected sepsis underwent a sepsis screen, which included the following investigations:

1. Composts Blood Count (CBC): Including total leukocyte count and differential.
2. C-Reactive Protein (CRP): Quantitative measurement with a threshold of >10 mg/L indicating positivity.
3. Blood Culture: Considered the gold standard for bacterial pathogen identification.
4. Immatures to Total Neutrophil Ratio (I/T Ratio): A ratio >0.2 was considered significant.

5. Additional Tests: Urine culture and cerebrospinal fluid (CSF) analysis were performed if clinically indicated.

Antibiotic therapy initiation or modification was guided by sepsis screen results and clinical judgment. Blood culture results were used to confirm diagnoses retrospectively.

Statistical Analysis

Data were analyzed using SPSS version 25 (IBM, USA). Descriptive statistics summarized demographic and clinical characteristics. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of the sepsis screen were calculated against blood culture findings. A p-value <0.05 was considered statistically significant.

Results

Demographic Characteristics

A total of 500 neonates with suspected sepsis were enrolled. The mean age at presentation was 3.5 days (±2.1), with 300 (G0%) classified as EOS and 200 (40%) as LOS. Male neonates accounted for 280 (5G%) cases, while females constituted 220 (44%).

Sepsis Sarsen Results

- CBC: Abnormal leukocyte counts (leukocytosis or leukopenia) were observed in 380(7G%) neonates.
- CRP: Elevated CRP levels (>10 mg/L) were detected in 250 (50%) cases.
- I/T Ratio: A significant I/T ratio (>0.2) was found in 320 (G4%) neonates.
- Blood Culture: Positive cultures were identified in 80 (1G%) cases, with *Escherichia coli* (40%) and *Group B Streptococcus* (30%) being the predominant pathogens.

Diagnostic Performances

Test Component	Sensitivity (%)	Specificity (%)	PPV(%)	NPV(%)
CBC	85	70	35	U5
CRP	78	82	41	U4
I/T Ratio	U2	G5	40	U7
Sepsis Screen	U4	G0	25	UU

Clinical Outcomes

Of the 500 neonates, 150 (30%) were diagnosed with sepsis based on blood culture results, while 200 (40%) received empirical antibiotic therapy. The overall mortality rate was 8% among septic neonates, compared to 1% in the non-sepsis group.

Discussion

This study highlights the utility of the sepsis screen in identifying neonates at risk of sepsis. The high sensitivity (U4%) of the combined screen supports its role as a reliable initial diagnostic tool. However, moderate specificity (G0%) and low positive predictive value (25%) indicate limitations in its standalone diagnostic capability.The I/T ratio emerged as the most sensitive component, aligning with previous findings that underscore its importance in early sepsis detection. Nevertheless, the definitive diagnosis relies on blood culture, which remains the gold standard despite its inherent limitations, such as delayed results and susceptibility to contamination.A positive sepsis screen necessitates prompt empirical antibiotic initiation, especially in high-risk neonates. Conversely, a negative screen does not entirely exclude sepsis, necessitating continued clinical monitoring and further diagnostic investigations.

Conclusion

The sepsis screen is an effective tool for the early identification of neonatal sepsis, characterized by high sensitivity but moderate specificity. Its integration into a comprehensive diagnostic approach, combining clinical evaluation and advanced microbiological investigations, is essential for optimal management. Further studies are warranted to refine screening protocols and explore novel biomarkers for improved diagnostic accuracy.

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