

Correlation of C-Reactive Protein with Neonatal Sepsis in Term and Preterm Neonates

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Abstract: Neonatal sepsis had vague signs and symptoms, so high index of suspicion help in arriving to an early diagnosis and management of sepsis. Neonatal sepsis is most common in male neonates and neonates with antenatal complications like premature rupture of membranes and meconium-stained amniotic fluid. Respiratory distress is the most common clinical presentation in our study. This finding is more common in preterm neonates. Blood culture yield is poor; hence diagnosis of sepsis with rapid diagnostic tests is necessary. C-REACTIVE PROTEIN as the rapid diagnostic test which has high sensitivity in diagnosis of neonatal sepsis. C-REACTIVE PROTEIN can be considered in both term and preterm neonates.

Keywords: Neonatal sepsis C-REACTIVE PROTEIN Preterm Neonate Term Neonate Blood Culture

1. Introduction

Neonatal sepsis is a clinical syndrome of bacteremia with systemic signs and symptoms of infection within the first 28 days of life. When pathogenic bacteria gain access into the blood stream, they may cause overwhelming infection without much localization (septicemia) or may get predominantly localized to the lung (pneumonia) or the meninges (meningitis) with or without a positive blood culture.

Septicemia usually consists of bacteremia and signs and symptoms caused by the microorganisms or their toxic products in the circulation. The presence of signs and symptoms distinguishes this condition from transient bacteremia, observed in some healthy neonates.

In country like India and other developing countries, neonatal sepsis is the single most important cause of neonatal deaths in the community, accounting for over half of them. If diagnosed early and treated aggressively with antibiotics and good supportive care, it is possible to save most cases of neonatal sepsis.

Maternal factors, fetal factors and interventions including feeding techniques are responsible for neonatal sepsis. Low socio-economic state, contaminated, unclean delivery leading to maternal infection and premature and low birth weight delivery, and poor postnatal follow up are the common causes for neonatal sepsis.

The high frequency of infection in the new born is due to the immaturity of the immune system at birth, more so when it is a pre-term baby and decreased transplacental transfer of maternal immunoglobulins in a pre-term delivery.

Neonatal sepsis remains a diagnostic and treatment challenge for modern neonatal care providers, with mortality rates as high as 30% to 69% of affected infants. Developing countries have both the highest incidence and the highest mortality rates.

Bacterial infections contribute significantly to morbidity and mortality in newborn infants. Successful treatment depends on early initiation of appropriate antibiotic therapy, but early

diagnosis of neonatal bacterial infections is difficult because clinical signs are non-specific and may initially be subtle.

We have very few modalities for investigating neonatal sepsis, positive blood cultures still remain the gold standard for the diagnosis of sepsis, but many times the cultures may be negative even in a symptomatic neonate.

When blood culture is negative we have to depend on other parameters for diagnosis of neonatal sepsis. These tests should be economical, fast and reliable. One of these is C-reactive protein which is supposed to be very specific for neonatal sepsis. C-reactive protein (CRP), an excellent marker for established neonatal bacterial infections.

2. Aims and Objectives

- To estimate the C-reactive protein levels in neonatal sepsis.
- To correlate the C-reactive protein levels with blood cultures.

3. Methodology

100 neonates with suspected neonatal sepsis admitted to GSL, neonatal intensive care unit (NICU) during the study period January 2021 to January 2022, were the subjects for this present study. The subjects of this study were divided into two groups: Group 1: Term neonates (37 and >37 weeks) and Group 2, Preterm neonates (<37 weeks), each of 50 in number.

Babies born to mother with history of fever before delivery and prolonged rupture of membrane (PROM) were also included in the study. Mother with history of antibiotic usage during labor or if the neonate died within the study period in NICU or if babies age is of more than 28 days were excluded from the study.

Gestational age assessment was done for all babies and 50 term and 50 preterm babies with suspected neonatal sepsis were selected as the subjects for the present study to compare each other.

During admission all the babies were evaluated with detailed history of their mothers and perinatal events including maternal factors that predisposing to sepsis were done. The etiological factor for suspected neonatal sepsis is evaluated in both term and preterm groups.

Bacteriological profiles in these 100 subjects were studied by blood culture and other cultures like gastric aspirate cultures, ET tube culture, urine culture, etc is done depending on requirement and their comparison is done with CRP. The clinical presentations of sepsis between preterm and term babies are seen and compared.

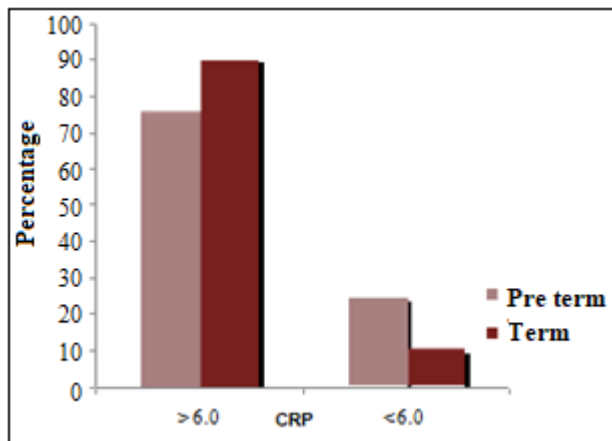
Correlation of CRP with blood cultures is done in both the groups separately

Study Design: A prospective clinical correlation study consisting of 100 neonates is undertaken to study the estimation of C-reactive protein levels in neonatal sepsis, to correlate C - reactive protein levels with blood cultures.

Correlation of CRP values in term and preterm neonates with suspected neonatal sepsis

CRP	Term	Pre Term	Total
>6.0	45 (90.0)	38 (76.0)	83(83.0)
<6.0	5 (10.0)	12 (24.0)	17 (17.0)
Total	50 (100.0)	50 (100.0)	100 (100.0)
Mean \pm SD	16.74 \pm 13.47	15.37 \pm 17.86	16.06 \pm 15.75

p= 0.107, Figures in parenthesis indicate percentage



Correlation of CRP values in term and preterm neonates with suspected neonatal sepsis:

CRP of more than 6mg/l is considered as positive, in this study 83% of suspected neonates were positive for sepsis and 17 % are negative. The above table shows that CRP is

Culture	True Positive	False Positive	True Negative	False Negative	Total
Term					
CRP vs. Blood Culture	11	34	1	4	50
Pre Term					
CRP vs. Blood Culture	7	31	0	12	50
All Cases					
CRP vs. Blood Culture	18	65	1	16	100

The 65% of false positive cases which determine the presence of sepsis in culture negative cases is significant. This indicates the need of CRP in diagnosis of sepsis. The false positive cases are little more in term neonates, indicating that CRP is significantly well produced in term septic neonates compare to preterm.

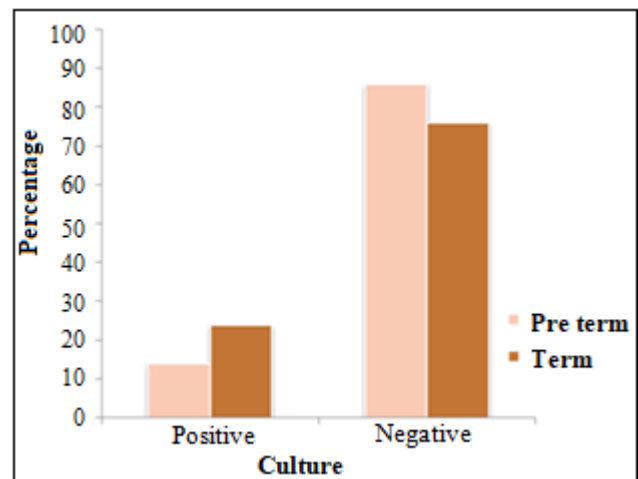
positive more in term neonates, compared to preterm suggesting that term neonates are more susceptible to produce acute phase reactants (90% vs. 76%). In negative cases (<6mg/dl) preterm are more compare to term neonates (10% vs. 24%). Even CRP positive cases are more in term neonates, there is no much difference between two groups, with p>0.107. Hence, the CRP can be considered in both groups as the diagnostic test for neonatal sepsis.

Blood culture:

Blood culture was done in all 100 cases among them 19% of the neonates with suspected neonatal sepsis in this study have the blood cultured positive for organisms, out of them 12 in term and 7 in preterm neonates. This shows there is no much difference in blood culture positive among term and preterm groups (24% vs. 14%) with p>0.202. the remaining 81% of the neonates have no growth for any organisms.

Culture	Term	Pre Term	Total
Positive	12 (24.0)	7 (14.0)	19 (19.0)
Negative	38 (76.0)	43 (86.0)	81 (81.0)
Total	50 (100.0)	50 (100.0)	100 (100.0)
Inference	Culture positivity is statistically similar between two groups with p= 0.202		

Figures in parenthesis indicate percentage



Correlation of CRP with Cultures: An observation

This data shows that, out of 19 cases which were blood culture positive, only one case is negative for CRP, similarly comparing with all cultures positive it was 2 in 31 cases. There is no much difference in term and preterm.

Correlation of CRP with Culture: An evaluation

Culture	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	P Value
Term						
CRP vs. Culture	91.7	10.5	24.4	80.0	30.0	1.000
Pre Term						
CRP vs. Culture	100.0	27.7	18.4	100.0	38.0	> 0.174
All Cases						
CRP vs. Culture	94.74	19.75	21.69	94.12	34.00	> 0.182

4. Conclusions

- Neonatal sepsis had vague signs and symptoms, so high index of suspicion help in arriving to an early diagnosis and management of sepsis.
- Neonatal sepsis is most common in male neonates and neonates with antenatal complications like premature rupture of membranes and meconium-stained amniotic fluid.
- Respiratory distress is the most common clinical presentation in our study. This finding is more common in preterm neonates.
- Blood culture yield is poor; hence diagnosis of sepsis with rapid diagnostic tests is necessary.
- CRP as the rapid diagnostic test which has high sensitivity in diagnosis of neonatal sepsis. CRP can be considered in both term and preterm neonates.
- Gram-negative organisms are common at GSL-NICU in this study.

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