



A Study on Association Between Crp and Blood Culture in Neonatal Sepsis

KEYWORDS

Neonatal sepsis, CRP, Blood culture.

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ABSTRACT Neonatal sepsis is the leading cause of death in our country. Blood culture for its diagnosis is time consuming so need for other parameters for early diagnosis. The present study is an endeavor to study the CRP in neonatal sepsis.

Aim of study: To study CRP as an early indicator of sepsis and its statistical association with blood culture (considered as gold standard) in neonatal septicemia.

Material & methods: In 292 clinical cases of neonatal sepsis, CRP, blood culture and other necessary investigations were done. We studied association between CRP & blood culture positivity in neonatal sepsis.

Results: In 292 cases of neonatal sepsis, blood culture was positive in 107 (36.64%) while CRP was positive in 192 (65.76%). CRP test was positive in 92.52% blood culture positive and 50.27% blood culture negative cases ($P=0.0000$).

Conclusion: A statistically significant association between blood culture positivity and CRP levels was found in the present study. Hence estimation of CRP levels and the interpretation in the light of clinical picture can serve as a useful tool for the early diagnosis of neonatal sepsis.

Introduction:

Neonatal sepsis remained a major cause of infant morbidity and mortality. According to National Neonatal Perinatal Database (NNPD) 2000 neonatal sepsis is the most common cause of deaths in the country followed by prematurity & birth asphyxia^{1,2}.

To prevent serious morbidity and mortality due to neonatal sepsis, it is important that the diagnosis is made early and treatment started within the shortest possible time frame. Even though a positive blood culture, is gold standard for diagnosis of neonatal sepsis the technique is time consuming, demands a proper laboratory setup and is positive in only 40% cases so need to evaluate surrogate markers of inflammation as possible tool for early diagnosis of neonatal sepsis³. So present study was undertaken to study CRP as an early indicator of sepsis and its statistical association with blood culture (considered as gold standard) in neonatal septicemia^{4,5}.

Aim of study:

To study CRP as an early indicator of sepsis and its statistical association with blood culture (considered as gold standard) in neonatal septicemia.

Material & methods:

This prospective observational study was carried out in the neonatal unit of tertiary care teaching hospital in central India during the period of August 2011 to September 2013 after ethical clearance from institutional ethical committee. Both outborn as well as inborn neonates admitted with diagnosis of neonatal septicaemia according to criteria by Vergnono et al⁶ were included in study after informed parental consent. Septicemia was classified into Early onset septicemia (EOS) and late onset septicemia (LOS) as per standard guidelines⁷.

Diagnostic work up included complete hemogram with

peripheral blood smear, CRP, blood culture and sensitivity (C/S). Chest X-ray, Urine C/S, cerebrospinal fluid (CSF) analysis and fungal C/S were done wherever necessary. All specimens were collected before starting antibiotics.

The CRP estimation was done with rapid slide agglutination test, using C – Reactive Protein (CRP) Reagent (Accu-care) Latex test without predilution manufactured by Lab-Care Diagnostic (India) Pvt. Ltd. The test was performed as per the instructions given by the manufacturer.

If no agglutination was observed with test serum test was considered negative and/or CRP concentration less than 6 mg /lit which is a minimum concentration of CRP detected by this test. If marked agglutination was observed the test was considered positive and /or CRP concentration above 6 mg/dl in the test serum.

Association between CRP and blood culture positivity were assessed by McNemar's chi square test with exact McNemar significance probability with 95% conf. interval. A p value less than 0.05 (<0.05) is considered statistically significant.

Results:

Over the study period, 292 neonates with neonatal septicemia were included in the study. Amongst them, EOS was seen in 190 (65.07%) cases and LOS in 102 (34.93%) cases. Of the total 292 neonatal septicemia cases, 182 (62.33%) were male and 110 (37.67%) were female.

Of the total 292 cases, 58.91% were delivered in hospital, 14.38% were delivered at home, Lower segment caesarian section (LSCS) was performed in 21.92% cases and instrumentation was done in 4.79% cases.

Table 1 shows C-reactive protein (CRP) levels in neonatal septicemia cases.

Table 1. C-reactive protein (CRP) test in neonatal septicemia cases

CRP test	Number of cases (%)
Positive (CRP \geq 0.6 mg/dl)	192 (65.76)
Negative (CRP < 0.6 mg/dl)	100 (34.24)
Total	292 (100)

Out of 292 cases, CRP test was positive in 192 cases (65.76%) and was negative in 100 cases (34.24%).

Table 2 shows blood culture positivity in early onset septicemia (EOS) and late onset neonatal septicemia (LOS) cases.

Table 2. Blood culture positivity in early onset and late onset septicemia

Blood Culture	EOS (%)	LOS (%)	Total (%)
Positive	66 (34.74)	41(40.20)	107 (36.64)
Negative	124 (65.26)	61(59.80)	185 (63.36)
Total	190(100)	102(100)	292 (100)

Of the total 292 neonatal septicemia cases, early onset septicemia cases were 190 and late onset septicemia cases were 102. Of the 190 early onset neonatal septicemia cases, blood culture was positive in 66 (34.74%) cases. Similarly, out of 102 late onset neonatal septicemia cases, blood culture was positive in 41 (40.20%) cases.

Table 3 shows association of CRP with blood culture positivity in neonatal septicemia cases. It shows that CRP test was positive in 92.52% blood culture positive and 50.27% blood culture negative cases and this association is statistically significant (p value =0.0000).

Table 3. Association of CRP with blood culture positivity in neonatal septicemia

Blood culture	CRP test		Total
	Positive (%)	Negative (%)	
Blood Culture Positive	99 (92.52)	8 (7.48)	107(100)
Blood Culture Negative	93 (50.27)	92 (49.73)	185(100)
Total	192 (65.75)	100 (34.25)	292(100)

Table 4 shows association of CRP with type of neonatal septicemia. It shows that CRP test was positive in 124(64.58%) cases of early onset septicemia and 68(35.42%) cases of late onset septicemia and this association is not statistically significant (p value >0.05)

Table 4. Association of CRP with early onset septicemia and late onset septicemia

Type of septicemia	CRP Positive(%)	CRP Negative (%)	Total
Early onset septicemia	124 (64.58)	66 (66)	190
Late onset septicemia	68 (35.42)	34 (34)	102
Total	192(100)	100(100)	292

Discussion:

Neonatal septicemia remains a challenging and important problem even with modern drug therapy. It is associated with considerable morbidity and mortality. It is difficult to diagnose the neonatal infection, because of its non-specific clinical signs and symptoms. Microorganism detection has its value as a strong diagnostic method for neonatal septicemia. But it is time consuming, demands a proper laboratory setup and is positive in only 40% cases so need to evaluate surrogate markers of inflammation as possible tool for early diagnosis of neonatal sepsis.

Adhikari et al⁸ studied haemoglobin, total white blood cell count, differential white count, ESR, platelet count, C-reactive protein (CRP), serum immunoglobulins, plasma C3 and haptoglobin in neonatal septicemia cases. They showed that the CRP titre (measured by latex agglutination) was the only reliable non-specific indicator of infection.

The acute phase C-reactive protein (CRP) may increase more than 1000 fold during acute phase response. Because of its short half life of 19 hours, CRP levels can be expected to fall quickly after efficient elimination of microbial stimulus. Thus CRP may sufficiently reflect the individual balance between the microbe and the immune system of neonate for monitoring the effect of antibiotic treatment and for guiding the duration of antibiotic therapy. Normalization of CRP levels has previously been proposed as a possible criterion for the discontinuation of antibiotic therapy⁹. CRP estimation has established itself as one of the important test in identifying the neonatal infections.

In the present study, CRP was positive in 65.75 % cases and negative in 34.25 % cases (Table 1). Further, CRP test was positive in 92.52% blood culture positive and 50.27% blood culture negative cases. Adhikari et al⁸ also observed statistically significant association of CRP with blood culture positivity. The titre was elevated more often in culture positive (16/19) than culture negative (7/17) babies.

Table 4 shows association of CRP with type of neonatal septicemia. It shows that CRP test was positive in 124 cases of early onset septicemia and 68 cases of late onset septicemia.

In the present study, blood culture positivity in neonatal septicemia cases was 107 (36.64%), whereas in 185 (63.36%) of cases there was no growth (Table 2).

Conclusions:

Neonatal septicemia is one of the important causes of infant morbidity and mortality in our set up. Blood culture should be done in all cases of suspected sepsis prior to starting antibiotics.

CRP has been documented to be the only non-specific reliable indicator of infection. A good association between blood culture positivity and CRP levels was found in the present study. Hence estimation of CRP levels and the interpretation in the light of clinical picture can serve as a useful tool for the early diagnosis of neonatal sepsis.

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