



## Original Research Article

## Comparison of CRP with blood culture in the diagnosis of neonatal septicaemia

Abha Gupta<sup>1</sup>, Dharmendra Rajput<sup>1</sup>, Sadhna Sodani<sup>1,\*</sup>, Anita Mutha<sup>1</sup><sup>1</sup>Dept. of Microbiology, MGM Medical College (Devi Ahilya University), Indore, Madhya Pradesh, India

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## ABSTRACT

**Introduction:** In neonates, septicaemia is one of leading cause of morbidity and mortality. Therefore, timely diagnosis is important to prevent fatal outcome. C-reactive protein is an important biomarker that aids in the timely diagnosis of neonatal septicaemia.

**Aim:** The present study was carried out to compare the accuracy of CRP in the diagnosis of neonatal septicaemia with blood culture.

**Materials and Methods:** 148 neonates diagnosed with neonatal sepsis were included in the study over a period of 6 months. Blood culture and semi-qualitative assessment of CRP was done for all the patients.

**Results:** Of the 148 neonates studied, 53 were blood culture positive while 101 were CRP positive. The sensitivity, specificity, positive and negative predictive values and diagnostic accuracy of CRP were 86.7%, 43%, 45.5%, 85% and 69% respectively.

**Conclusion:** The specificity and sensitivity of CRP against blood culture strengthen the use of this acute phase protein in the diagnosis of neonatal sepsis.

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## 1. Introduction

Sepsis is a major cause of morbidity and mortality among neonates. It is one of the leading cause of death in neonates in our country.<sup>1</sup> Neonatal septicaemia is defined as localized or systemic condition resulting from adverse reaction to the presence of an infectious agent(s) or its toxin(s).<sup>1</sup> Clinical manifestations of neonatal sepsis are non-specific, therefore, clinical diagnosis of sepsis is difficult and laboratory help is required. The gold standard for diagnosis of bacterial sepsis is blood culture, may be primary or secondary to a focal infection (osteomyelitis, gastroenteritis, pyelonephritis, and endocarditis).<sup>2</sup> The clinical manifestation of neonatal sepsis are not specific and usually occur in the late stages of the infection.<sup>3</sup> C-reactive protein (CRP) is a part of a protein group called acute phase reactants that is produced by the liver and is considered as an inflammatory marker. C-reactive protein is commonly elevated during an infection

but are not specific for infection and do not identify any specific infection. These tests can be used to monitor response to therapy.<sup>3</sup> The half life of CRP is 19 hours and in acute response its level increases up to thousand fold and comes down rapidly as the source is removed. After effective treatment, its levels can fall rapidly in 5-7 hours. CRP crosses through placenta in very low quantities, so any elevation in a newborn always represents endogenous synthesis.<sup>4</sup>

## 2. Aims &amp; Objective

Aim of the study was to compare CRP against blood culture in diagnosis of neonatal Sepsis.

## 3. Materials and Methods

A retrospective Study design was used to study on combining use of CRP and blood culture in early diagnosis of neonatal sepsis. This is a hospital based study conducted in M.G.M Medical College and Hospital, Indore, (M.P.)

\* Corresponding author.

E-mail address: [sadhna@sampurnadiagnostics.com](mailto:sadhna@sampurnadiagnostics.com) (S. Sodani).

India from January -2019 to June-2019 (6months).

### 3.1. Inclusion criteria

All newborns who were diagnosed with septicaemia with a positive blood culture and CRP level to validate and confirm the diagnosis and those neonates who were also diagnosed with septicaemia with a negative blood culture and CRP levels.

### 3.2. Exclusion criteria

Neonates who had received antibiotics before collection of blood samples having surgical problems, chromosomal or congenital anomalies were excluded from the study.

Blood culture bottles that were received from paediatrics department were incubated at 37°C aerobically. After overnight incubation blood culture bottles were examined for indicators of growth like turbidity, haemolysis or discrete colonies on the surface of sedimented red cells. If any of these were present subculture was done on to blood agar and MacConkey agar. If indicators of growth were not present primary subculture was done after 48 hours of incubation on blood agar and MacConkey agar. If no growth occurred on plates after overnight incubation, bottles were incubated further and observed daily for indicators of growth till 7 days. A final subculture was done at the end of day 7 or at appearance of indicators of growth which ever was earlier. The colonies grown on blood agar and MacConkey agar were identified by conventional methods according to the standard laboratory protocol, including colony morphology, Gram staining and biochemical reactions<sup>5</sup> C-reactive protein was estimated semi quantitatively by using the CRP latex kit manufactured by the Pathozyme diagnostics (P) Limited. The CRP latex reagent was standardized to detect serum CRP level of  $\geq 6$  ug/ml, which was considered the lowest concentration of clinical significance. CRP level can be calculated in term of micrograms per ml by multiplying the highest dilution giving clear cut agglutination with a factor of 6.

## 4. Result

148 neonates suspected of septicaemia were included in the study, information on demographic data, blood culture and the level of CRP was extracted.

**Table 1:** Demographic data of the study population

Variables	Sex	
	Male (%)	Female (%)
Sepsis	28(19)	25(17)
Clinical sepsis	50(34)	45(30)
Total	78(53)	70(47)

As shown in Table 2. 46(31%) neonates had sepsis with positive blood culture, and positive CRP level. 55(37%)

**Table 2:** Comparison of blood culture and CRP in patients with neonatal septicaemia

Variables	Blood culture positive	Blood culture negative
CRP positive	46	55
CRP negative	7	40
Total	53	95

neonates with clinical signs of sepsis but their blood culture was negative and positive CRP level. Culture positive but CRP negative samples are 7 (5%) & CRP negative & culture negative are 40(27%).

**Table 3:** Sensitivity, specificity, PPV, NPV and diagnostic accuracy of CRP

Test	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
CRP	86.7%	42%	45.5%	85%	69%

## 5. Discussion

The study group consists of 78 males (53%) and 70 females (47%). Males have been reported to be more likely than females to develop septicaemia as revealed in this study. Faridi et al. also reported 66.67% males and 33.33% females out of 63 cases of neonatal septicemia.<sup>6</sup> And also similar to findings of other studies reported from India.<sup>7,8</sup> In our study, out of the 53 blood culture positive samples, 46 (86.7%) were positive for CRP which was similar to studies done by Gowsami Y et al.,<sup>9</sup> and Hisamuddin E et al.,<sup>10</sup> In this study CRP reported to have Sensitivity of 86.7%, Specificity of 42%, Positive Predictive Value of 45.5%, Negative Predictive Value of 85% and diagnostic accuracy of 69% against blood culture these result are similar to studies done by Younis S et al.,<sup>11</sup> and Chauhan S et al.<sup>12</sup>

## 6. Limitation

This study has several limitations, these limitations is related to the observational nature of this research and low sample size. Many factors such as antibiotic use and age, gestational age, maternal history of infecting were not recorded. Such factors would be helpful to examine such association in depth.

## 7. Conclusion

The specificity and sensitivity of CRP against blood culture strengthen the use of this acute phase protein in the diagnosis of neonatal sepsis and would help the clinicians to fix the period of antibiotic treatment and medical management to reduce the liver damage due to antibiotic exposure, development of bacterial resistance and neonatal mortality.

## 8. Source of Funding

None.

## 9. Conflict of Interest

The authors declare no conflict of interest.

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## Author biography

**Abha Gupta**, Post Graduate

**Dharmendra Rajput**, Assistant Professor

**Sadhna Sodani**, Associate Professor

**Anita Mutha**, Professor and HOD

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