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C-Reactive Protein as Biomarker for Neonatal Septicemia

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ABSTRACT

Background: Diagnosis of neonatal sepsis is always a challenge on the basis of clinical feature.
Objective: To evaluate the role of C-reactive protein in diagnosis neonatal septicemia.
Materials and Methods: The prospective observational study in which clinically suspected to have sepsis was included with the age group of first 28days (4week) of life (infant age) in study. Blood culture done by conventional method and CRP performed by semi quantitative latex agglutination method. Positive cultures were the standard test to compare CRP test.
Results: A total of 78 were positive of which EOS 69(88.46%). The total CRP was positive 70(89.74%) out of 78 Blood culture positive. Low Birth weight was more 55(70.51%) compare to normal birth weight and preterm53 (67.97%) were more common septicemic.
Conclusion: CRP test utilizing quantitative latex agglutination method result may help for screening neonatal sepsis in clinical decision making.

Keywords: Blood culture, CRP, Neonates, Septicemia,

INTRODUCTION

Neonatal septicemia is defined as localized or systemic condition resulting from adverse reaction to the presence of an infectious agent(s) or its toxin(s). [(1)] This may be classified in two types before 72 hours early onset septicemia (EOS) and after 72 hours of birth late onset septicemia (LOS). [(2)] Neonatal sepsis is one of the major causes of morbidity and mortality among the newborns in the developing world. Babies are more susceptible than mothers and infections in infants are more difficult to detect. [(3)] Clinical diagnosis of sepsis in new born is not easy because of nonspecific symptoms and signs. But early recognition, diagnosis and treatment of serious infection in the neonate is essential to confer a healthy life to those newcomers to the world. Blood culture is the gold standard for the diagnosis of the neonatal sepsis but it usually takes at least 48 hours to generate a useful report. Newborn babies are too delicate to give those few hours to the treating clinicians. [(4)] C-reactive protein (CRP) is a widely used acute-phase sepsis marker. [(5)] Its advantages include its very low serum levels in normal infants, a rapid rise within 12 to 24 hours of sepsis and a large incremental increase thereafter. [(6)] This is the simple and best which can be done within a short time and which help to make critical decision regarding treatment. So, the present study was conducted to evaluate the role of CRP in diagnosis of neonatal septicemia in a tertiary care centre.

MATERIALS AND METHODS

This was a hospital based prospective study carried out in the Department of Microbiology and Pediatrics of a tertiary care centre Rama medical college Kanpur, UP.
Inclusion criteria: All newborns with clinical suspicion or risk factors for sepsis were recruited into the study.
Exclusion criteria: Babies who had received antibiotics before collection of blood samples having surgical problems, chromosomal or congenital anomalies were excluded from the study.

Study period: March 2018 to February 2019

Ethical clearance was from Institutional Ethical Committee.

Procedure: Neonates, who were clinically suspected to have sepsis, were subjected blood culture and C-reactive protein estimation.

C-reactive protein was estimated semi quantitatively by using the CRP latex kit manufactured by the Tulip Laboratories (P) Limited. The CRP latex reagent was standardized to detect serum CRP level at or above 0.6 mg/dl, which was considered the lowest concentration of clinical significance. Visible agglutination of latex particles constituted a positive result which indicated a level of CRP≥0.6 mg/dl. Semi quantitative result was generated after making serial dilution as per manufacturer guideline.

RESULT

Distribution of case accordin onset and culture positivity.

Age of onset	Culture positive		Culture negative		Total	
EOS	69	88.46%	100	68.03%	169	75.11%
LOS	9	11.54%	47	31.97%	56	24.89%
Total	78	100%	147	100%	225	100%

Early onset septicemia (EOS), late onset septicemia (LOS)

Comparison of CRP results with positive blood culture (N=78)

	Total CRP positive	Culture positive CRP positive	Culture positive CRP negative	Culture negative CRP positive (N=147)
No of Cases	70	70	8	40
Percentage	89.74%	89.74%	10.25%	27.21%

Note:- CRP: C-reactive protein.

Relation between birth weight and sepsis.

Birth weight in grams	No of cases	Percentage
>2.5	23	29.49%
to <2.5	55	70.51%
Total	78	100%

Gestational Age and Sepsis.

Gestational age	No of cases	Percentage
Preterm	53	67.95%
Fullterm	25	32.0%
Total	78	100%

DISCUSSION

This is very common in the present situation in India. The disease has got high morbidity and mortality but it is unfortunate that none of laboratory parameters available till are rapid, specific, sensitive, cheap and simple enough to confirm the diagnosis and to assess the prognosis or therapeutic response in this condition. The present study was concluded to assess the efficacy and reliability of CRP in neonatal septicemia and values of the CRP as a tool of prognosis in neonatal septicemia. CRP production is very early and sensitive response to most form of microbial infections. In the present study a total of suspected case was 225 of which 78(34.66%) were cultures positive. Early onset septicemia 69(88.46%) and late onset septicemia 9(11.54%). The other work shows more LOS (51%) as compared to EOS (49%). Mhada *et al*. reported 23% of preterm neonates, in their study. [(7)] This study was also supported by other study where EOS was more common. [(8,9)] In table no. 2 shows that CRP result comparison with blood culture positive of which 78 blood culture positive 70(89.74%) and culture positive CRP positive 70(89.74%) it indicates number culture positive is equal to CRP positive this result may help for early diagnosis of neonatal septicemia and can reduce mortality rate, culture positive CRP negative 8(10.74%) very less in number this results may direct to CRP test.

In this study CRP has sensitivity of 89.74% but in some other Indian studies sensitivity of CRP was just 16.9%, [(10)] 48.39%, [(11)] 50% [(12)] and 52.3% [(13)] whereas in the studies in Thailand. [(14)] Pakisthan [(15)] and Nigeria [(16)] sensitivity of the test was 100%, 85.6%, and 74% respectively. One of the causes of the wide variation is the

difference in laboratory techniques (Latex agglutination, ELISA, RIA, Nephelometry, Immunoturbidimetry) employed for the test Sample size also act as a deciding factor for this discripancy.CRP appeared most useful test in our situation having high sensitivity. Elevated CRP in relation to sepsis was found to be highly significant in this study. In table no. 3 shows that relation birth weight with sepsis of which low birth weight was 55(70.51%) followed by normal birth weight 23(29.49%). Table no. 4 shows gestational age with sepsis among 78 positive cases preterm was 53(67.95%) and Fullterm 25(32%). This study finding is similar with other Indian studies. [(17,18)]

CONCLUSIONS

After vivid evaluation the parameters of sepsis, CRP levels appeared to be the single best predictor for diagnosing EONS in comparison to other hematological parameters. Semi quantitative assay of CRP is simple as well as easy to perform at the bedside by any medical staff and result will be available within 10min.

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