

Original Research Article

CORRELATION OF RESULT OF BLOOD CULTURE AND C REACTIVE PROTEIN TEST IN NEONATAL SEPTICEMIA.

ABSTRACT:

INTRODUCTION:

Neonatal septicemia is a major cause of morbidity and mortality in neneonatal intensive care unit. As the clinical manifestations are nonspecific, it is necessary to made early diagnosis to reduce morbidity and mortality. So, an effort was made to determine the correlation between blood culture and C reactive protein (CRP) in neonate presenting with features of sepsis to aid in the early and effective diagnosis.

AIM: To study CRP as an early indicator of sepsis and its statistical association with blood culture in suspected cases of neonatal septicaemia.

MATERIAL & METHODS: This retrospective study was conducted from July 2013 to December 2013 in tertiary care teaching Hospital, Ahmedabad. Total 300 Blood samples were received from clinically suspected patients of neonatal septicaemia from neonatal intensive care unit, and processed by BACT/ALERT 3D automated blood culture instrument and CRP was determined in the same. We studied association between CRP & blood culture positivity in neonatal sepsis.

Results: In our study; out of 300, 143 samples had positive results for CRP test i.e. 47.6%. In a total of 93 culture positive detected sample of neonatal septicaemia, 80 samples were CRP positive. It indicates the sensitivity of CRP test to detect neonatal septicaemia to be 86.02%. In a total of 207 culture negative sample, 144 samples were detected negative by CRP results .Hence, the specificity of CRP was found to be 69.5%.

Conclusion:

The present study depicts a significant correlation between blood culture positivity and CRP levels. Thus, estimation of CRP levels and its interpretation

in the light of clinical picture can aid as a tool for the early diagnosis of neonatal sepsis.

Key Words: Neonatal septicaemia, C reactive protein

INTRODUCTION:

Neonatal septicaemia is defined as any systemic bacterial infection documented by positive blood culture in neonates. Generally it is an important cause of morbidity and mortality among neonates.^[1]

Neonatal septicaemia may have subtle, diverse and non-specific clinical signs. Therefore, early diagnosis and treatment of the neonates with suspected sepsis are mandatory to prevent severe and life-threatening complications.^[2]

The gold standard method for diagnosis of septicaemia is the isolation of the micro-organisms from the blood culture which takes 48 hours to 7 days to confirm diagnosis. It is important to have regular surveillance of neonatal units to assess the prevailing Pathogens and antibiotics susceptibility for guidance of clinicians and to identify and control the outbreaks due to cross infection.^[3]

Creactive protein test (CRP) ^[4]: This is an abnormal β -globulin produced by liver during; any inflammatory process, bacterial infections, malignancies and even in tissue destruction by the liver as a result of stimulation by interleukin. After the onset of infection CRP level takes at least 10-12 hours to rise and are therefore of little use in early diagnosis of early onset disease. But after 24 hours CRP value is very helpful and this test also has prognostic value as the levels strongly fall when patient is responding to treatment. The test can be performed by capillary precipitation technique in which patients sera react with antiserum prepared in rabbits against purified CRP or by passive agglutination

method in which latex particles coated with anti CRP antibody (Commercially available kits). CRP can be accurately measured by RIA, ELISA, laser Nephelometry single radial immuno diffusion assay. The aim of the present study was to determine the efficiency of CRP which may be used as a parameter to identify the time period when antibiotics therapy can safely be stopped in case of suspected neonatal septicaemia.

MATERIALS AND METHODS:

This is the retrospective study, conducted from July 2013 to December 2013 in tertiary care teaching Hospital, Ahmedabad. A total of 300 Blood samples were received from clinically suspected patients of sepsis from Neonatal intensive care unit. A detailed history was taken and proforma was filled for each Patient documenting age, sex, socioeconomic status, address, duration of illness along with artificial intervention, birth weight and any resuscitative procedures done. Venous blood was collected aseptically before initiation of antibiotic therapy.^[5] Blood samples were collected with sterile syringe and needle after thorough cleaning of the venous site with 70% alcohol and subsequently followed by povidone iodine and immediate cleaning of the rubber cap of the BacT/ALERT culture bottle with 70% alcohol. The used needle was then replaced with a new needle. Venous blood was injected into this bottle containing brain heart infusion broths in the ratio of one part of blood to five parts of the broth. The blood culture broths were immediately sent to the laboratory, where they were incubated at 37°C for 7 days.

The bottle loaded in Bact /ALERT Instruments, an automated system which incubates, shakes and monitors culture bottles for signs of microbial growth, where they were incubated at 37°C for 7 days.^[6]

Processing of specimen for bacterial pathogen:

If microbial growth appears and instrument gives signal positive and if microbial growth does not appear for more than 7 days after incubation, the sample declare negative. From the signal positive bottle, smear and gram staining were made and also subculture on MacConkey, Blood and Chocolate agar and that were incubated in appropriate temperature and atmospheres according to standard guidelines.^[6]

Second Day Follow Up:

All inoculated plates were observed the next day and the colony characteristics we identified by using the standard microbiological procedures like Gram staining , wet preparation for motility and Biochemical reactions as described in Practical Microbiology of Mackie MacCartney 14th volume.^[7] After the isolation of bacteria, antibiotic sensitivity testing was done by Kirby-Bauer disc diffusion method on Muller Hinton (MH) agar as per CLSI recommendations .^[8] The resistance patterns we observed, like ESBL by phenotypic combine disk method and Metallo-betalactamase by phenotypic combine disk method. We also identified Amplified cephalosporinase by Modified Three-Dimensional Test (MTDT). CRP was measured by latex agglutination method (SPAN Diagnostics Ltd.). A value of more than 6 mg% was taken as abnormal. After the initiation of antibiotic treatment, 48 hours later again do the CRP test , If it comes less than 6 mg%, antibiotics have to be stopped.

RESULT:

The study was conducted at the department of Microbiology in a Tertiary care hospital, Ahmedabad. The blood for CRP and Culture specimens of suspected cases of neonatal septicaemia were received during July 2013 to December 2013. Results made from study are described below.

Blood Culture positivity rate:

Out of 300 suspected cases, 93 cases (31%) were culture positive. Of the 93 isolated organisms, 42(45.1%) were Gram positive organisms that include - *Coagulase negative staphylococcus* [CONS] 38(40.86%), *Staphylococcus*

aureus 3 (3.2%), *Enterococcus Fecalis* 1(1.07%) , isolates of *Candida* species were 3 (3.23%) and Gram negative organisms 48(51.61%) like *Klebsiella pneumonia* 26(27.9%), *E.coli* 14(15.05%), *Acinetobacter baumannii* 2(2.15%), *Pseudomonas aeruginosa* 4 (4.3%) and *Proteus mirabilis* 2(2.15%).

CORRELATION OF RESULT OF BLOOD CULTURE AND CRP TEST

In our study, out of 300 samples, 143 samples had positive results for CRP test i.e. 47.6% sample. In a total of 93 culture positive detected sample of neonatal septicaemia, 80 samples were CRP positive. It indicates that sensitivity of CRP test to detect neonatal septicaemia was 86.02%. In a total of the 207 culture negative sample, 144 samples were detected negative by estimation of CRP. Thus, specificity of CRP was 69.5%, which illustrates a relatively lower specificity rate.

Table 1-Result

Total Sample		Positive		Negative		
BloodCulture - 300		93		207		
CRP - 300		143		157		
	<i>Total Culture Positive</i>	<i>Total CRP positive</i>	<i>Culture positive + CRP positive</i>	<i>Culture positive + CRP negative</i>	<i>Culture negative + CRP positive</i>	<i>Culture negative + CRP negative</i>
<i>No. Of cases</i>	93	143	80	13	63	144
<i>Percentage of total sample size</i>	31%	47.6%	26.6%	4.33%	21%	48%

130 DISCUSSION

131 In our study 143 out of 300 total samples had positive results for CRP test i.e.
 132 47.6%. Out of the total 93 culture positive detected sample of neonatal
 133 septicaemia 80 samples were CRP positive. It indicates that sensitivity of CRP
 134 test to detect neonatal septicaemia is 86.02%. 144 samples were detected
 135 negative by CRP results out of the 207 culture negative sample. Thus,
 136 specificity was 69.5%. In our study CRP test shows lower specificity rate.

137 These results were similar to the results obtained by study conducted by
 138 Rajendraprasad et al ^[9] in 2012 with sensitivity of 87.37% and specificity of
 139 71.43%. Mannan et al^[10] in 2005 also had similar results with sensitivity of
 140 92.86% and specificity of 36.11%, thus CRP can be viewed as having higher
 141 sensitivity rate and can be used in cases suspected of having neonatal
 142 septicaemia as it is rapid comparative to culture though chances of false
 143 negative results are high.

144 **Table -2 Comparision of study**

	Our study	Rajendraprasad et al ^[9]	Mannan et al^[10]
Sensitivity	86.02%	87.37%	92.86%
Specificity	69.5%	71.43%	36.11%
Positive predictive value	55.9%	73.45%	-
Negative predictive value	91.72%	86.21%	-

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146 **CONCLUSION:**

147 In the newborn, systemic bacterial infection plays a significant role due to its
148 direct impact on neonatal mortality and morbidity. In spite of availability of
149 sources for early diagnosis and treatment, still handling the cases of neonatal
150 sepsis is challenging job for neonatologists because of changes in epidemiology
151 and the lack of diagnostic markers. The necessity of biomarker with good
152 diagnostic accuracy and reliability is paramount as a guiding tool for physicians
153 to assess the risk of infection and need for antibiotic therapy.

154 Our study concludes that serum CRP is simple method for diagnosis of neonatal
155 septicaemia. These tests are helpful to rule out neonatal infection and their
156 treatment can be started by clinician as soon as possible within one hour, which
157 is not only in tertiary care centers but also in remote area primary health care
158 centers, unlike conventional methods that take upto seven days for blood culture
159 for diagnosis of infection and septicaemia.

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161 **COMPETING INTEREST:**

162 “Authors have declared that no competing interests exist.”

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164 There is no ethical issue. This research was done during residency period for
165 study purpose only.

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