

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 newborn . As the clinical manifestations are vague and nonspecific, it is pertinent that an early diagnosis is made to prevent serious morbidity and mortality. So, an attempt was made to establish correlation between C reactive protein (CRP) & blood culture in neonate presenting with features of sepsis to accelerate the diagnostic process.

AIM: 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: The study was conducted from July 2013 to December 2013 in tertiary care teaching Hospital, Ahmedabad. Total 300 Blood culture samples were collected from clinically suspected patients of sepsis from neonatal intensive care unit. Total 300 Blood culture samples were collected from clinically suspected patients of sepsis from Neonatal intensive care unit, and processed by BACT/ALERT 3D automated blood culture instrument. And their CRP test also performed.

We studied association between CRP & blood culture positivity in neonatal sepsis.

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

Conclusion: A statistically significant association between blood culture positivity and CRP levels was found in the present study. Hence estimation of

Comment [H1]: Repetition. To be erased.

CRP levels and the interpretation in the light of clinical picture can serve as a useful tool for the early diagnosis of neonatal sepsis.

Key Words:- Neonatal septicemia , C reactive protein

INTRODUCTION:

Neonatal septicemia describes any systemic bacterial infection in neonates documented by positive blood culture. It is an important cause of morbidity and mortality among neonates generally.^[1]

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

The gold standard for diagnosis of septicemia is the isolation of the microorganisms 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]

C reactive 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. CRP level takes at least 10-12 hours to rise after the onset of infection and are therefore unhelpful 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 of patients sera with antiserum prepared in rabbits against purified CRP or by passive agglutination method using latex particles

Comment [H2]: Space.

Comment [H3]: Delete the dot, this is one sentence.

Comment [H4]: Add a space

59 coated with anti CRP antibody (Commercially available kits). Accurate
60 measurement of CRP can be made by RIA, ELISA, laser nephelometry single
61 radial immuno diffusion assay.

62 CRP may be used as a parameter to identify the time period when antibiotics
63 therapy can safely be discontinued in case of suspected neonatal septicemia,
64 which was the aim of the present study.

Comment [H5]: spacing

65 MATERIALS AND METHODS:

66 The study was conducted from July 2013 to December 2013 in tertiary care
67 teaching Hospital, Ahmedabad. Total 300 Blood culture samples were collected

Comment [H6]: Was this a prospective or retrospective data review study using existing facility data.

68 from clinically suspected patients of sepsis from Neonatal intensive care unit
69 A detailed history was taken and Performa was filled for each Patient
70 documenting age, sex , socioeconomic status, address, duration of illness along
71 with artificial intervention, birth weight and any resuscitative procedures done.
72 Venous blood was collected aseptically before initiation of antibiotic therapy. ^[5]
73 Blood samples were collected with sterile syringe and needle after thorough
74 cleaning of the venous site with 70% alcohol and subsequently followed by
75 povidone iodine. And again with 70% alcohol then the rubber cap of the
76 BacT/ALERT culture bottle were immediately cleaned with 70% alcohol. Then
77 used needle was replaced with a new needle and then, the venous blood was
78 injected into this bottle containing brain heart Infusion broths in the ratio of one
79 part of blood to five parts of the broth. The blood culture broths were
80 immediately sent to the laboratory, where they were incubated at 37°C for 7
81 days .

82 The bottle loaded in Bact /ALERT Instruments which is automated systems that
83 incubate, shake and monitor culture bottles for signs of microbial growth, where
84 they were incubated at 37°C for 7 days. ^[6]

85 Processing of specimen for bacterial pathogen:

86 If microbial growth appear then instrument give signal positive and if microbial
87 growth not appear than after 7 days the sample declare negative if signal
88 positive than unload bottle and make smear and gram staining and subculture on
89 MacConkey, Blood and Chocolate agar media and incubated in appropriate
90 temperature and atmospheres according to standard guidelines.^[6]

91 Second Day Follow Up:

92 All inoculated plates were observed next day and the colony characteristics
93 were identified by using the standard microbiological procedures like Gram
94 staining , wet preparation for motility and Biochemical reactions as described
95 in Practical Microbiology of Mackie MacCartney 14th volume.^[7] After the
96 isolation of bacteria, antibiotic sensitivity testing was done by Kirby-Bauer disc
97 diffusion method on Muller Hinton (MH) agar as per CLSI recommendations
98 .^[8] And resistance pattern identify like ESBL by phenotypic combine disk
99 method and Metallo beta lactamase by phenotypic combine disk method. we
100 also identify Amplified cephalosporinase by Modified Three-Dimensional Test
101 (MTDT)

102 CRP Test is also performed using latex agglutination

103 CRP was measured by latex agglutination method (SPAN Diagnostics Ltd.). A
104 value of more than 6 mg% was taken as abnormal. CRP was measured again 48
105 hours after initiation of therapy. If it was less than 6 mg%, antibiotics were
106 stopped.

107 RESULT:

108 The study was conducted at department of Microbiology in Tertiary care
109 hospital Ahmedabad. The Blood for CRP and blood culture specimen in
110 BacT/Alert Bottles were received of suspected neonatal septicemia cases from
111 July 2013 to December 2013. Results and observations made from study are
112 described below.

113 Blood Culture positivity rate:

114 Out of 300 suspected cases 93 (31%) was culture positive.

Comment [H7]: add s

Comment [H8]: add the before instrument and

Comment [H9]: add s to give

Comment [H10]: positive signal of microbial growth, rather than signal positive

Comment [H11]: does not appear for more than 7 days after incubation

Comment [H12]: the sample was declared negative. add a dot after negative. Start sentence with capital I. If

Comment [H13]:

Comment [H14]: Statement not clear. Language issue. Is the author trying to say that "If the signal was positive more than the unloaded bottle, a smear and gram staining was made for culture on....." This sentence need to be rewritten to convey the idea and message the author want to pass to the reader

Comment [H15]: This should be identified.

Comment [H16]: Check if this is not a repetition

Comment [H17]: The tense should be past tense

Comment [H18]: Tense, was , instead of is

Comment [H19]: The before department

Comment [H20]: To be rewritten. It should read: "The blood for CRP and Culture specimens of suspected cases of neonatal septicemia were received from July 2013 to December 2013".

115 Of the 93 isolated organisms, Of the 93 isolated organisms, 42(45.1%) were
 116 Gram positive organisms that include - *Coagulase negative staphylococcus*
 117 *aureus* [CONS] 38(40.86%), *Staphylococcus aureus* 3(3.2%), *Enterococcus*
 118 *Fecalis* 1(1.07%) ; isolates of *Candida* species were 3(3.23%) and Gram
 119 negative organisms 48(51.61%) which includes - *Klebsiella pneumonia*
 120 26(27.9%), *E.coli* 14(15.05%), *Acinetobacter baumannii* 2(2.15%),
 121 *Pseudomonas aeruginosa* 4(4.3%), *Proteus mirabilis* 2(2.15%).

Comment [H21]: repetition

Comment [H22]: repetition section to be deleted

122 CORRELATION OF RESULT OF BLOOD CULTURE AND CRP TEST

123 In our study 143 out of 300 total samples had positive results for CRP test i.e.
 124 47.6% sample. Out of the total 93 culture positive detected sample of neonatal
 125 septicemia 80 samples were CRP positive. It indicates that sensitivity of CRP
 126 test to detect neonatal septicemia 86.02%. 144 samples were detected negative
 127 by CRP results out of the 207 culture negative sample. Thus, specificity was
 128 69.5%. In our study CRP test shows lower specificity rate.

129 Result – Table 1

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

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131

132 DISCUSSION

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

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

146 **Table -2**

	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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148 **CONCLUSION:**

149 Systemic bacterial infection in the newborn creates a significant burden due to
 150 its impact on neonatal mortality and long-term morbidity. In spite of ongoing
 151 efforts in early diagnosis, treatment, and prevention, neonatal sepsis still
 152 remains an enigmatic area for neonatologists due to changes in epidemiology
 153 and the lack of ideal diagnostic markers. The need for a biomarker with high
 154 diagnostic accuracy and reliability is paramount as a guiding tool for physicians
 155 to assess the risk of infection and need for antibiotic therapy.

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

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163 **COMPETING INTEREST:**

164 “Authors have declared that no competing interest exist .”

165 **REFERNCES :**

- 166 1) Kenneth CI, Olufmlayo YE, Iretiola BB. Bacteriological Profile Of
 167 Neonatal Septicaemia In A Neonatal Septicaemia In Tertiary In Nigeria.
 168 African Health Sciences. 2006; 6 (3);151- 4

- 2) Amela S, Fahrija S, Mustafa B, Zijad S. The predictive score for early-onset neonatal sepsis. *The Turkish journal of Pediatrics*. 2010; 52: 130-44
- 3) Rabiya S, Nusrat K, Shugfta H. Bacteriology & Anti- Microbial Susceptibility of Neonatal Septicemia in NICU , PIMS, Islamabad –A Tertiary Care Hospital of Pakistan. *Ann. Pak. Inst. Med. Sci.* 2010; 6(4): 191-5
- 4) Correlation study of CRP and Blood culture in evaluation on Neonatal Sepsis. Dissertation by Dr. Ravi Kyadigeeri at Department of paediatrics , Shree Siddhartha medical college , Karnataka . Submitted to Rajiv Gandhi University of health sciences , Bangalore, Karnataka.
- 5) Colle JG, Praser AG, Marimon BP, Mackie SA, McCartney. *Practical Medical Microbiology* . 14th ed. Churchill Livingstone; 2008: 123-4.
- 6) Nwadioha SI, Nwoledi EO, Kashibu E, Odimayo MS, Okwori EE. A review of bacterial isolates in blood culture of children with with suspected septicaemia in a Nigerian tertiary hospital. *African Journal of Microbiological Research*. 2010; 4: 222-5.
- 7) Aletayeb SM, Khosravi AD, Dehdashtian M, Kompani F, Mortazavi SM, Aramesh RM. Identification of Bacterial agents and antimicrobial susceptibility of neonatal septicaemia : A 54 month study in tertiary hospital. *African Journal of Microbiology Research*. 2011; 5(5): 528 -31.
- 8) Report of the National Neonatal Perinatal Database. Report 2002-2003. NNPD Network.2005.
http://www.newbornwhocc.org/pdf/nnpd_report_2002-03.PDF. Cited 2014.Dec 13.