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 septicemia.

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 septicemia 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

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

Key Words:Neonatal septicemia, C reactive protein

INTRODUCTION:

Neonatal septicemia 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 septicemia 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 septicemia 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 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

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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 septicemia.

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:

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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 was made and subculture on MacConkey, Blood and Chocolate agar and 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 susp[ected 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*

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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 septicemia, 80 samples were CRP positive. It indicates that sensitivity of CRP test to detect neonatal septicemia 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**		
	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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DISCUSSION

In our study 143 out of 300 total samples had positive results for CRP test i.e. 47.6%. 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.

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

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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CONCLUSION:

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

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

COMPETING INTEREST:

"Authors have declared that no competing interest exist ."

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

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