

The Value of C-Reactive Protein Concentration in the Blood in Early Diagnosis of Neonatal Sepsis

Khalid. R. Easa, Khalid - B- Kago, Nidhal. M. Kadhum

ABSTRACT:

BACKGROUND:

Neonatal sepsis refers to systemic infections which include septicemia, pneumonia, arthritis, osteomyelitis and urinary tract infection.

Infections are important cause of neonatal and infant morbidity and mortality as many as 2% of fetuses are infected in utero also is responsible for 30-50% of total neonatal deaths.

OBJECTIVE:

To evaluate the role of C- reactive protein concentration in early diagnosis of neonatal sepsis and to determine the duration and follow up of treatment.

PATIENTS AND METHODS:

A cross sectional study was performed in the neonatal intensive care unit (N.I.C.U) at Ibn Al-Balady hospital in Baghdad governorate. One hundred sixty five neonates less than 30 days with birth weigh more than 1500 gram suspected clinically to have neonatal sepsis and blood was drawn for C-reactive protein and blood culture. Also blood was drawn for complete blood count including WBC and differential count which was of little or no value in the diagnosis.

RESULTS:

C- reactive protein was sensitive (62%) (by immunometric test) a method for early diagnosis and for treatment and follow up of neonatal sepsis.

CONCLUSION:

C- reactive protein was good predictor and sensitive (62%) for diagnosis of neonatal sepsis and could detect the duration of antibiotic therapy. Hematological profile was not significant in diagnosis of neonatal sepsis.

KEY WORDS: neonatal sepsis, C-reactive protein, blood culture, N.I.C.U. (Neonatal intensive care unit).

INTRODUCTION:

Septicemia is a recognized cause of morbidity and mortality in the newborn in developing countries [Validity, Hismuddin ⁽¹⁾].

It is a clinical syndrome characterized by systemic signs and symptoms and bacteremia during the first month of life. Septicemia is known as 'early onset' disease if present during first 5-7 days of life and considered as 'late onset' if it follows after first week [High antibiotic, Mahmood ⁽²⁾].

The study reported group B streptococcus as the most common microorganism followed by gram negative enteric bacteria especially E. coli. Other causative microorganisms include streptococci, anaerobes and Hamemophilus influenza [Incidence, Afif ⁽³⁾].

Although neonatal sepsis is a serious illness but is curable if identified early. Over the last decades, a variety of laboratory tests have been developed to enhance the early and accurate identification and treatment of neonates with suspected sepsis, good evidence exist to support the use of CRP measurements to establish or exclude the diagnosis of sepsis in full term or near-term infants [Heart Rate, Griffin ⁽⁴⁾].

AIM OF THE STUDY:

The aim of the study is to examine the possibility of using C-reactive protein in the early diagnosis of neonatal sepsis, as well as its use determining the duration of the antibiotic course treatment.

PATIENTS AND METHODS:

The study was conducted at Neonatal intensive care unit (NICU) at Ibn-Balady Hospital

Department of Pediatric- Ibn Al-Balady Hospital.

Baghdad city. Total number of neonates 165 less than 30 days with birth weight more than 1500 gram suspected clinically to have sepsis were admitted from February to October, 2015. Blood was drawn for culture, hematological profile and C- relative protein concentration level in clinically suspected neonatal sepsis by the pediatrician at that time depending on clinical symptoms and signs and the presence of maternal factors for neonatal sepsis.

Bacteriological study:

These tests were done in the main laboratory at Ibn Balady Hospital in Baghdad governorate. Culture bottles were used with the BacT/ALERT Microbial. Detection system in qualitative procedures for enhanced recovery and detection of aerobic and facultative microorganisms (bacterial and yeast) from blood [Evaluation, Dionisia F⁽⁵⁾].

Serological Study:

For c-reactive protein-measured by 2 methods:

- 1-2 ml of venous blood was drawn and kept in the test tube with complete clotting then serum was separated for testing.
- Immunometric assay (Nycocard kit): Nycocard CRP single test is a solid phase. A sandwich formal immunometric assay was done.

Hematological study:

The CELL-DYN Emerald functions as a compact, automated hematology analyzer, which has been designed for the purpose of in – vitro diagnosis clinical labs. The device performs a complete blood count (CBC) and platelet count.

RESULTS:

The patients are divided into 4 groups according to their age. As shown in table (1).

Table 1: Groups of patients' study according to age.

G ₁ (1-2) days	14 case	14%
G ₂ (3-6) days	29 case	28%
G ₃ (7-13) days	21 case	21%
G ₄ (14-30) days	38 case	37%

Total number of neonates is 165, out of 165 samples (all study groups) suspected to have neonatal sepsis 102 were blood culture positive,

while blood culture negative were 63 as shown in table (2).

Table 2: Groups of blood culture result.

Blood culture	G ₁ 24 No. %	G ₂ 52 No. %	G ₃ 39 No. %	G ₄ 50 No. %	Total No. 165
Culture +ve	14 14%	29 28%	21 21%	38 37%	102 65%
Culture -ve	10 16%	23 36%	18 29%	12 19%	63 38%

Serology: Investigation for CRP was done about 12 hours after admission to the hospital and it is performed by semi- quantitative latex agglutination test and by immunometric assay. Results are given as negative 0-6 mg/dl for latex test, and 5 mg/dl for

immunometric assay. In latex agglutination 165 serum samples were tested, 86(52%) were positive while 79(48%) were negative. In immunometric method by Nycocard 102(62%) were positive while 63(38%) were negative as shown in table (3).

Table 3: Results of CRP Latex agglutination (method₁) compared with Nycocard (methods).

Method type	M ₁	M ₂
CRP +ve	86 (52%)	102 (62%)
CRP -ve	79 (48%)	63 (38%)
Total	165	165

Table 4: Hematological profile of positive and negative blood culture.

Screening test	Culture +ve N 102 (%)	Culture -ve N 63 (%)
WBC normal	86 (84%)	61 (96.8%)
WBC abnormal	16 (15.6%)	2 (3.7%)
Normal neutrophil count	67 (65.6%)	43 (68.2%)
Abnormal neutrophil count	35 (34.3%)	18 (28.5%)
Normal lymphocyte count	83 (81.3%)	60 (95.2%)
Abnormal lymphocyte count	21 (20.5%)	10 (15.8%)
Normal monocyte count	68 (66.6%)	58 (92.9%)
Abnormal monocyte count	41 (40.1%)	5 (7.9%)
Normal platelets count	86 (84.3%)	55 (87.3%)
Abnormal platelets count	16 (15.6%)	8 (12.6%)
Normal PCV	71 (69.6%)	36 (57.1%)
Abnormal PCV	31 (30.3%)	27 (42.8%)

Analysis of Hematological profile includes total WBC count, WBC differential count (neutrophil, lymphocyte, and monocyte count), Platelets count and PCV were obtained from hematology auto analyzer. We studied the correlation between blood culture and hematological profile results.

DISCUSSION:

The percentage of EOS (early onset sepsis was 42%) (43 cases) while LOS (Late onset sepsis) was 58% (59 cases) in present study which is agreed with study conducted by [Neonatal septicemia, EJK⁽⁶⁾] who reported percentage (24%) and (76%) respectively. The result of blood culture in the present study is 62% (102 cases) positive blood culture and 38% (63 cases) negative blood culture which is agreed with showed result (52%) positive blood culture reported by [C-reactive protein, Charhan S.⁽⁷⁾]. The hematological profile in our study is not useful tool for diagnosis of neonatal sepsis as shown in table (4) and this was agreed with [procedure in clinical, J. Vandepitte⁽¹⁹⁾], in that total white blood cell count has little value in the diagnosis of early onset and late onset sepsis, this is regarding leukocyte count or total neutrophil count and platelet count showed no significant association with sepsis [Role of hematological profile Haider S⁽¹⁵⁾]. The level of significance for statistical differences was set at $P \leq 0.05$.

The major problem in neonatal infection is the identification of the infected infant and the equally important task is to identify the non-infected infant because of the nonspecific clinical symptoms and signs and the delay of result of blood culture and inability of CRP test to distinguish between infection by bacteria or virus or inflammation.

In the present study 165 neonates, categorized as having sepsis by positive (blood culture, CRP) and negative (blood culture, CRP) also the

complete blood count with differential count is widely used either single or in conjunction with other tests.

The hematological profile in our study is not useful tool for diagnosis of neonatal sepsis that agreed with [Role of hematological, Haider.⁽¹⁵⁾] and the total leukocyte count or the total neutrophil count show no significant association with sepsis [Basic lab, J. Vandepitte,⁽¹⁴⁾] platelet count, in infected infant gives no value and is late indicator of sepsis [Thrombocytopenia, Tiago OBI,⁽¹⁶⁾].

The best method for rapid diagnosis of neonatal sepsis is by immunochemical method by Nycocard & it is more sensitive (62% of blood culture +ve patients) than agglutination assay method 52%, so CRP assay is useful for rapid diagnosis of neonatal sepsis and this is in agreement with [c-reactive protein, Chanhon⁽⁷⁾], [Fetns and newborn, Richard. A⁽¹³⁾].

REFERENCES:

1. Hisamuddin, F.; Hisam, A.; Wahid, S.; Raza, G.. Validity of C-reactive protein (CRP) for diagnosis of neonatal sepsis. *Pak J. Med Sci.* 2015;13: 527-31.
2. Mahmood A, Karamat KA, Butt T. Neonatal sepsis 2002. High antibiotic resistance of bacterial pathogens in a Neonatal Intensive Care Unit in Karachi. *J Pak Med Assoc.* 2002; 52: 348-50.
3. Afif, AS, Samawal L, Mosa AL., Incidence of bacterial isolation from blood culture in the intensive care unit of Tertiary care Hospital international Journal of Drug Development and Research. October; 2012;4: 354-67.
4. Griffin M, Lake D, O'Shea T and T Michael Moorman T.. Heart Rate, Characteristics and clinical signs in Neonatal sepsis. *Ped. Res.*, 2007;61: 222-27.

5. Dionisia F Isabel 5(2009). Evaluation of Bact/Alert VITAL and blood culture systems for the diagnosis of bacteremia. Article first published online & Nov. 2009.
6. EJK. Al Zwani. Neonatal septicemia in neonatal care unit Al-Anbar governorate, Iraq Eastern mediteranian Health Journal 2012;8.
7. Chanhhan S. Vaghasia V. Chanhhan B. C. reactive protein (CRP) in early diagnosis of neonatal sepsis NATIONAL OF MEDICAL RESERCH 2012.
8. Aurang zeb, B, Hameed A. Neonatal sepsis in hospital born babies: bacterial isolates and antibiotic susceptibility pattern J call Physicians Surg park NOV. 2012; 3: 629-32.
9. Boma A West Oie men P. Rosemary O. Ugwand U Eneh (2012). Anti-microbial Resistance and U Eneh (2012). Anti-microbial Resistance and infection control, 1: 22 published on line June 22.
10. Shala A. Mohammad T. et al (2012). Trends in incidence of Neonatal sepsis and Antibiotic susceptibility of causative agents in two Neonatal intensive care Units in Jehran, I.R. 2012;1: 124-30.
11. Asindi AA et al. Neonatal septicemia Saudi Med J. 201: 550-53.
12. S. Vergnano M. Sharland. Neonatal septicemia; an international perspective Arch Dis. Child Fetal Neonatal Ed 2015;220-24.
13. Richard A POLIN and the COOITTEE ON FETUS AND NEWBORN. Pediatric Originally Polish online, April 30, 2012. DOL: 10.1542/PED 2012.
14. J. Vandepitt and J. Verhaegen. Word Health Organization Geneva Basic lab. Procedures in clinical bacteriology, 2013; 6 NOS June 22.
15. Haider S. Sadia R. Rida T. Role of Hematological profile in early diagnosis of neonatal sepsis Ann. Park Ins. Ned. Sci. 2012;6: 152-58.
16. Tiago OBI; Mario FB et al (2012). Thrombocytopenia in sepsis: an important prognostic factor. Rev.bras.ter. intensive vol. 24 no. Sao Paulo Jan/Mar. 2012.