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

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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.

KEYWORDS: 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, Hismmuddin [(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)]].

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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

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. 1-2 ml of venous blood was drawn and kept in the test tube with complete clotting then serum was separated for testing.
2. 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- quantitive 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 (method$_1$) 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 connt	67 (65.6%)	43 (68.2%)
Abnormal neutrophil connt	35 (34.3%)	18 (28.5%)
Normal lymphocyte connt	83 (81.3%)	60 (95.2%)
Abormal lymphocyte connt	21 (20.5%)	10 (15.8%)
Normal monocyte connt	68 (66.6%)	58 (92.9%)
Abnormal monocyte connt	41 (40.1%)	5 (7.9%)
Normal platelets connt	86 (84.3%)	55 (87.3%)
Abnormal platelets connt	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 connt,WBC differential count (neutrophil, lymphocyte, and monocyte connt), Platelets connt 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 connt or total nenrophil connt and platelet connt 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 bactria 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 connt with differential connt 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 connt or the total neutrophil connt show no significant association with sepsis [Basic lab, J. Vandepitte, [14]] platelet connt, 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 immnnometric 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 position, Chanhan [7]], [Fetns and newborn, Richard. A [13]].

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