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EVALUATION OF THE SERUM C-REACTIVE PROTEIN IN DIAGNOSIS AND TREATMENT OF NEONATAL SEPSIS

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Abstract:

Objective: *The purpose of this study is to assess the competence of serum C-Reactive protein in the detection of Neonatal Sepsis and role of this protein in the determination of the period of antibiotic therapy in Neonatal Sepsis.* ***Methodology:*** *In this study we recruited one hundred and thirty-five patients suffering from suspected of sepsis in ten months from October 2018 to July 2019 in Mayo hospital Lahore We took the samples of blood from every newborn for sensitivity of culture and calculation of the level of serum C-Reactive protein. In all the suspected patients, empirical antibiotics like Ampicillin or Gentamycin were initiated after gathering of samples of blood. We marked the levels of Serum C-Reactive protein of greater than 5 mg/dl as positive results. We took the second samples of blood for the calculation of the serum C-Reactive protein after three days of the first sample. There were 2 end points of this research work; one point was the determination of the specificity and sensitivity of the serum C-Reactive protein against blood culturing and the 2nd point was the determination was the negative predictive value of C-Reactive protein during finding out the period of antibiotic treatment in patients appearing with Neonatal Sepsis.* ***Results:*** *Out of one hundred and thirty-five patients, 75.5% (n: 102) were present with sepsis utilizing reports of blood culture. The results of C-Reactive protein were present as positive in 62.9% (n: 85) neonates on initial baseline calculation and they were positive in 76.29% (n: 103) neonates after three days of initial measurement. C - reactive protein sensitivity in the detection of sepsis was 98.03%, 91% was specificity, PPV (Positive Predictive Value) was 97% and NPV (Negative Predictive Value) was 93.7%. The average duration of the antibiotic therapy in the C - reactive protein guided group was 5.03 days versus 7.02 days in the group of standard treatment duration with P value of less than 0.001. The value of NPV of C - reactive protein in the determination of the period of antibiotic therapy was hundred percent.* ***Conclusion:*** *The level of serum C - reactive protein is authentic test in the establishment of the detection of Neonatal Sepsis. It precisely checks the duration of the antibiotic treatment and outcomes in important decrease in the duration of treatment of Neonatal Sepsis.* ***KEYWORDS:*** *Neonatal Sepsis, Reactive Protein, Sepsis, Mortalities, Blood Culture, Sample, Antibiotic.*

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INTRODUCTION:

For the neonatologists, Neonatal Sepsis is a very challenging issue due to atypical signs [1, 2]. Neonatal Sepsis is the bacterial infection occurring in 1st month of life [3]. The rate of incidence of Neonatal Sepsis is 10 per 1000 to 15 per 1000 live births in the countries which are developed and 15 per 1000 to 25 per 1000 livebirths in countries located in South Asia [1, 4]. Neonatal Sepsis is accountable for 30% to 40% of total mortalities among neonates in the countries which are developing [5]. Recent recommendation is to give treatment to septic newborns for 2 to three days if the reports of blood culture are negative and for seven to fourteen days if the reports of blood culture are positive [6, 7]. In accordance with various research works, about 11% to 23% newborns obtained wrong treatment for Neonatal Sepsis [6-8]. This not only results in antibiotic resistance, but also has many complications of short term as well as some long term anomalies [9, 10].

There should be regionalization of the antibiotic treatment in accordance with the presence of the causative organisms [11]. Many research works have displayed that levels of C-Reactive protein may support in the early detection and determination of the total period of the treatment by antibiotics [12, 13]. The synthesis of the C-Reactive protein carried out in liver as an outcome of the insult is foreign objects and it remain on peak in the duration of inflammatory process and it rapidly reduced after the end of infection [10, 14]. In current research work, we assessed the effectiveness of C-Reactive protein in the diagnosis of Neonatal Sepsis and their role in the determination of the Neonatal Sepsis as well as antibiotic therapy duration in the newborns with suspected of Neonatal Sepsis.

METHODOLOGY:

We included total one hundred and thirty-five neonates getting treatment in Mayo Hospital, Lahore. The duration of this research work was from October 2018 to July 2019. Ethical committee of the institute gave the permission to conduct this research work. We selected all the neonates with suspected diagnosis of Neonatal Sepsis. We followed the standard criteria for the detection of the Neonatal Sepsis present in literature. We excluded the newborns having birth weight of less than 1500 grams, suffering from asphyxia or getting antibiotic treatment before their admission in this hospital. We took the samples of blood from every newborn for the culture sensitivity and measurement of the level of C - reactive protein in serum. We started the Gentamycin and Ampicillin after the collection of samples of blood. We marked the results positive if levels of Serum C -Reactive protein were greater than 5 mg/dl [15]. We collected the second blood samples for C-Reactive protein measurements after three days of first samples. Consecutive positive levels of C-Reactive protein the presence of Neonatal Sepsis. We followed the blood cultures for 5 days in the C-Reactive protein-guided group and 7 days in the group with standard treatment and for positive outcome reports. We divided the neonates with positive levels of C - reactive protein into 2 subgroups, we continued the antibiotics in first group and in 2nd group we continued the antibiotics for complete seven days. We kept the neonates for 2 days after end of the treatment with antibiotics to check the prevalence of fever if it occurs we will start the antibiotic treatment again.

We used the 2x2 tables for the calculation of the sensitivity and specificity. We used the SPSS V.20 for statistical analysis of the collected information. We used the independent statistics for the comparison of the average duration of the antibiotics treatment in both groups. We calculated the levels of C - reactive protein, reports of blood culture and relapse rates in frequencies.

RESULTS:

The average age of the patients in this research work 6.7 ± 4.9 days. Out of one hundred and thirty-five babies, 57.1% (n: 77) babied were from male gender and 42.9% (n: 58) babies were females. Majority of the babies, 63.8% (n: 86) appeared in their 1st week of life, 29.6% (n: 40) appeared in their 2nd life's week and 6.6% (n: 9) appeared in their 1st month of life. Among total neonates, reports of blood culture confirmed the presence of sepsis in 75.5% (n: 102) patients. We found the positive C-Reactive protein results in 62.9% (n: 85) newborns in initial baseline calculation and positive C - reactive protein results in 76.29% (n: 103) newborns after three days of admission. C-Reactive protein sensitivity in the detection of sepsis was 98.03%, 91% was its specificity, PPV was 97% and NPV was 93.7%. We found the majority of the neonates infected with gram negative microbes 75.5% versus only 24.5% with infections of gram positive organisms. E. coli, K. Pneumoniae and Pseudomonas Species were much frequent gram negative organisms. S. Aureus and S. Epidermidis were the most common among gram positive organisms causing the NS as presented in Table-1.

Table-I: Etiological Organisms Of Sepsis

Micro-organisms		Frequency	Percentage
Grams -ve organisms, n:77	Escherichia Coli	25	24.5
	Klebsiella Pneumonias	23	22.5
	Pseudomonas Species	18	17.6
	Acinetobacter	9	8.8
Grams +ve organisms, n:25	Enterobacter Cloacae	2	1.9
	Staphylococcus Aureus	12	11.8
	Staphylococcus Epidermidis	7	6.8
	a-Hemolytic Streptococci	4	3.9
	Enterococcus Faecalis	2	1.9

Out of one hundred and three newborns who were present with positive levels of C-Reactive protein on 2 consecutive findings, fifty-five newborns obtained C-Reactive protein guided antibiotic treatment and forty-eight neonates obtained standard antibiotic duration therapy. In group of C-Reactive protein guided patients, there were total forty-one newborns in whom antibiotics were hindered in ≤ 5 days of treatment and thirteen newborns the antibiotics duration was six to seven days and there was positive C-Reactive protein in one patient on seventh days and he became negative on the ninth day. Average antibiotic treatment duration in the group C-Reactive protein guided neonates was 5.03 days versus 7.02 days in the group of patients with standard treatment. No sepsis relapse was found in any participant. NPV of the C-Reactive protein in the determination of the antibiotics duration was 100%.

Table-II: Serum C-Reactive Protein Against Blood Culture

Serum C-Reactive Protein Characteristics	Percentage
Sensitivity	98.03%
Specificity	91%
Positive Predictive Value	97%
Negative Predictive Value	93.7%

DISCUSSION:

Neonatal Sepsis is one of the most common reasons of high rate of morbidity as well as mortality among newborns. The gold standard for the detection of Neonatal Sepsis is blood culture. But it is much time taking. CRO is widely studied among different hematological factors. In this current research work, we discovered the 98.03% sensitivity and 91% specificity of C-Reactive protein levels in the detection of Neonatal Sepsis among neonates after seventy-two hours of admission. These findings are very much close to the findings of [16]. Nuntnarumit discovered the 100% sensitivity and 94% specificity of C-Reactive protein among newborns of Neonatal Sepsis [17]. Benitz stated that there is an increase in the sensitivity of the C-Reactive protein in the detection of Neonatal Sepsis with the passage of time. He discovered the C-Reactive protein sensitivity only 40% in first twenty-four hours of sepsis and 90% after twenty-four hours of infection. Some research works discovered very low rate of sensitivity and specificity. Hisamuddin discovered only 76.92% sensitivity and 53.49% specificity [18].

Saeed also discovered the same outcomes about the sensitivity and specificity of C-Reactive protein [19]. There are unknown reasons for these disparities. There was short duration of antibiotics treatment in C-Reactive protein-guided group. Siddaiah also discovered the same results about the decrease in the duration of antibiotics treatment. Coggins carried out a research work in neonates with low weight suffering from Neonatal Sepsis and discovered significant diseases in duration of treatment with the use of C-Reactive protein-guided therapy. Jaswal [14] and Ehl [15,16] stated 100.0% and 99% NPVs of levels of serum C-Reactive protein in the determination of the duration of antibiotic treatment.

CONCLUSION:

The findings of this research work and available data conclude that the level of serum C-Reactive protein is very effective method in the detection of the Neonatal Sepsis and it correctly evaluate the total duration of treatment by antibiotics in the patients of Neonatal Sepsis and outcomes in the treatment's duration of Neonatal Sepsis.

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