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Original Research Article

Study the role of c-reactive protein and thrombocytopenia in diagnosing early neonatal sepsis

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ABSTRACT

Background: In clinical practice, early detection of neonatal sepsis remains difficult. Neonatal sepsis diagnosis is a challenge because of its non-specific presentation and the low sensitivity of the time-consuming bacterial cultures. So, many sepsis markers, like C-reactive protein (CRP) and platelet count, are emerging to improve its diagnosis. The aim of the study was to evaluate the role of CRP and platelet count in early neonatal sepsis
Methods: This study was conducted in the department of SNCU in Virudhunagar Government Headquarters hospital, 50 neonates with culture-confirmed sepsis were included. Before antibiotic treatment, neonates CRP and platelet count, and other inflammatory markers were assessed.
Results: In 50 newborns, culture was positive in 22 cases, CRP was positive in 24 cases, and thrombocytopenia in 18 cases. In 22 culture-positive cases, 19 cases are CRP positive, and 17 cases had thrombocytopenia. In 17 culture-positive thrombocytopenia cases, 16 cases are Gram-negative stain, 1 case is Gram-positive stain.
Conclusions: CRP and Platelet can be helpful in the future diagnosis of neonatal sepsis, despite being promising and convenient markers for neonatal sepsis.

Keywords: Neonatal sepsis, Platelets, CRP, Thrombocytopenia

INTRODUCTION

Septicemia is a common cause of high neonatal mortality. It is characterized by positive blood culture, thrombocytopenia and elevated C-reactive protein (CRP).[1] The newborn infant is susceptible to infection due to immaturity of both natural and acquired immune systems. Sepsis is considered a strong possibility for any clinical deterioration in a neonatal state. It is either early-onset (<7 days of birth) or late-onset (>7 days), and it is considered as one of the important leading factors for neonatal mortality and morbidity.[1] Consequently, early diagnosis is very important as it helps in beginning antibiotic therapy early, thereby reducing neonatal mortality.[2]

Blood culture remains the gold standard in identifying the infecting organism and provides vital information regarding the antibiotic sensitivity pattern so that proper usage of drugs can be made. However, blood culture generally takes at least 48 to 72 hours to detect bacterial growth, which causes a considerable time lag in initiating appropriate treatment. In addition, it has its disadvantages in CRP is an acute-phase protein synthesized in the liver in response to infection or inflammation. CRP is a biomarker and is elevated in sepsis.[3-4] Normal CRP concentration in healthy neonates is usually lower than 6 mg/L. Values more than this are considered CRP Positive. Neonatal sepsis is a challenging problem indeed, and physicians are always in need of methods of prediction and early diagnosis of sepsis to initiate therapy as rapidly as possible to decrease the negative impact on the patient's health and

therefore decrease the duration of hospital stay and costs. The need of the hour is to identify a test to confirm the presence of sepsis earlier and find out a parameter that reliably distinguishes between gram-positive and gram-negative sepsis, which may help in choosing the appropriate antibiotic without having to rely on the empirical coverage.

Aim

To evaluate the role of CRP and platelet count in early neonatal sepsis

METHODS

A Prospective diagnostic study was performed in the department of Special Newborn Care Unit in Virudhunagar Government Headquarters hospital from 2020 January and 2020 December. Informed consent from the parents was obtained. The newborns (50) were included in the study group to satisfy any of the following criteria. Newborns belonging to both sexes were admitted to this study. Only newborns within seven days of life were included in the study population. Inclusion and exclusion criteria: Newborns within 7 days of life showing the under-mentioned signs and symptoms, respiratory distress or apnea or gasping respiration, Temperature instability – hypothermia or fever, lethargy, poor cry, refusal of feeds, vomiting, ileus, abdominal distension, poor peripheral perfusion, bradycardia or tachycardia, more than 10 pustules in the body or purulent umbilical discharge along with periumbilical erythema, neonatal convulsions, irritability, hypotonia, altered sensorium. Before antibiotic treatment, neonates CRP and platelet count were assessed.

Statistical analysis

Statistical analysis was done with the help of Statistical package for social sciences (SPSS) version 21. Descriptive statistics and chi-square tests were used to infer results.

RESULTS

Fifty newborns that fulfilled the inclusion criteria were included in the study. Out of the 50 cases, 25 were male babies, and the rest 25 were female. Thus, male and female newborns contributed equally 50% of the sample population. On categorizing the newborns based on birth weight, 5 babies were of low birth weight, 43 newborns were of normal birth weight, and 2 babies were overweight, as depicted in Figure 1.

Blood culture was positive in 22 out of the 50 cases, CRP was positive in 24 cases, and thrombocytopenia was observed in 18 cases.

CRP was found to be positive in more number of blood culture-positive cases than blood culture-negative cases, as depicted in Figure 2.

In our study, thrombocytopenia was observed in 18 cases, out of which 17 were of culture-positive sepsis and in 1 case of culture-negative sepsis. Apart from this, the normal platelet count was observed in 32 patients, out of which 5 were culture-positive, and 27 were of the culture-negative group, as shown in Figure 3.

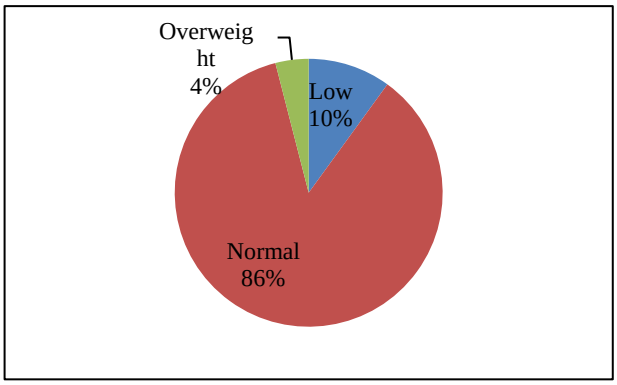

Figure 1: Distribution of birth weight.

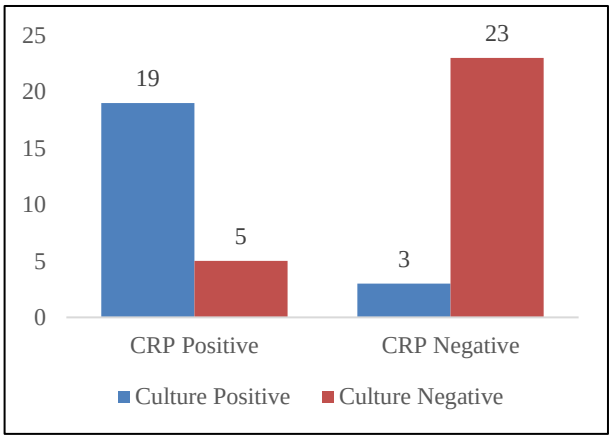

Figure 2: Cross-tabulation of CRP and Culture test.

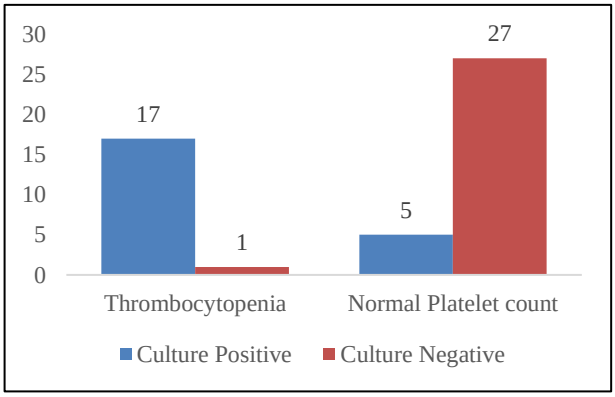

Figure 3: Cross-tabulation of platelet count and culture test.

Klebsiella is the commonest gram organism causing sepsis in the Neonatal Intensive Care Unit. The other gram-negative organisms encountered are *Escherichia Coli*, *Pseudomonas*, *Enterobacter*, and *Acinetobacter*. The

Gram-positive organisms grown are *Coagulase Positive and Coagulase-negative Staphylococci*, Group B *Beta Hemolytic Streptococcus*, and *Enterococcus*. Out of 18 thrombocytopenia neonatal, 17 shows Gram-negative and 1 shows gram-positive blood culture. (Figure 4).

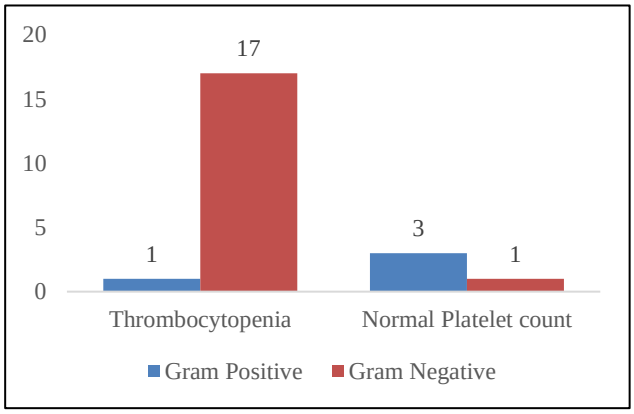

Figure 4: Cross-tabulation of platelet count and gram stain.

DISCUSSION

Neonatal sepsis is associated with high mortality as diagnosis of sepsis in neonates presents as a challenge because the clinical signs of sepsis are non-specific, and it mainly depended upon investigation. Among these blood cultures is the gold standard for diagnosing neonatal sepsis, but its utility is limited due to delayed reporting and low positivity.[2] To overcome this limitation and guide early diagnosis of neonatal sepsis, sepsis screens (CRP, micro ESR, hematological parameters) are used.

Out of the 50 babies under evaluation, 25 were male babies, and the rest 25 were female, contributing equally to 50% of the population studied. Out of the 50 babies with clinical suspicion of sepsis, the blood culture was positive in 22 newborns. Our study's rate of culture positivity was 44%, which correlates with Al-Musawi et al, whose study revealed a 45% growth in culture. This is also in accordance with the study by Shyamala et al., which showed a culture-positive rate of 51.3%.[5,6]

Similarly, Sriram et al reported a 50.4% on culture positivity in a study group of 115 neonates.[7] It correlates with the study of Shyamala et al.[6]

In this context, many of the studies conducted in the Indian subcontinent showed a high prevalence of gram-negative sepsis, while the western studies show a predominant gram-positive growth.[8]

The overall prevalence of thrombocytopenia in our study group is 81.8%, according to the study done by Torkaman et al.[9] It also correlates with the study done by Shyamala et al, which showed a 69.9% prevalence of thrombocytopenia.[6] This is in accordance with the study done by Guida et al, who also similarly found no statistical significance between thrombocytopenia and gram-negative sepsis.[10] Like our study, they also noted partial thrombocytopenia in gram-positive sepsis. In a recent study done in 2009 in Italy, Manzoni et al had reciprocated our analysis, concluding that thrombocytopenia is not an organism-specific marker of sepsis.[11] On the other hand, the analysis by Scheifele et al is in contrast with our study and states that the endotoxinemia in necrotizing enterocolitis with gram-negative organisms leads to thrombocytopenia.[12] Our study is also not in accordance with Rowe et al who had documented thrombocytopenia in gram-negative sepsis.[13]

Kudawla also observed that a decrease in platelet count was seen more in the late-onset sepsis group.[14]

Limitations

Larger the sample size would have provided accurate results for statistical test to assess significance and correlation.

CONCLUSION

As per our study results, qualitative analysis of C-reactive protein can be used as an early marker of sepsis, especially in resource-limited settings. Although thrombocytopenia occurs predominantly in gram-negative sepsis, there is insufficient evidence to support the use of platelet count to differentiate between gram-positive and gram-negative sepsis.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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