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Comparative Analysis of Diagnostic Accuracy of I:T (Immature to Total Neutrophil Ratio) & CRP in Screening of Neonatal Sepsis

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Abstract: ***Background: Neonatal Sepsis is a clinical syndrome characterized by signs and symptoms of infection, identified & confirmed by positive blood cultures. It is one of the important cause of morbidity and mortality particularly in the developing countries & constitutes the Commonest cause of neonatal death accounting for 52% of total neonatal deaths. Methodology: The 2 parameters used for screening neonatal sepsis were immature to total neutrophil ratio (I:T Ratio) which was determined on Giemsa stained smears &CRP which was estimated by the semi quantitative latex agglutination method. Conclusion: I:T is the single & most useful parameter for early diagnosis of neonatal sepsis. It has reasonably good sensitivity & can predict neonatal sepsis early with reasonable accuracy. I: T Ratio is more specific than CRP, thus it can more accurately be used for ruling out proven sepsis.***

Keywords: Neonatal sepsis, CRP, I:T ratio, giemsa stain, agglutination

1. Introduction

Neonatal Sepsis is a clinical syndrome characterized by signs and symptoms of infection, identified & confirmed by positive blood cultures.As per National Neonatal Perinatal Database (NNPD) 2002-2003, the incidence of neonatal sepsis in India was 30 per 1000 live birth [1].

Neonatal sepsis is frequent and important cause of morbidity and mortality particularly in the developing countries & constitutes the Commonest cause of neonatal death accounting for 52% of total neonatal deaths (lancet 1990)

SEPSIS NEONATORUM" refers to the generalized bacterial infection of infants during the first month of life. Systemic bacterial infection is known by the generic term neonatal sepsis which incorporates septicemia, pneumonia and meningitis.[2]Most cases of neonatal sepsis in the community are caused by Escherichia coli and Staphylococcus aureus. In hospitals, Klebsiellapneumoniae is also a common organism [2].

Neonatal sepsis can be classified into two sub-types depending upon whether the onset of symptoms is before 72 hours of life (early onset) or later (late onset) [3].

The main objective of this study –To evaluate the diagnostic efficacy of immature to total neutrophil ratio(I:T Ratio) &C-Reactive protein in the early diagnosis of neonatal septicemia, so that immediate treatment can be started before results of bacterial culture (The gold standard confirmatory test) become available.

2. Methodology

Total no. of neonatal sepsis cases studied = 100 (confirmed by blood culture as it is the Gold standard")

The 2 parameters used for screening neonatal infection

- Immature to total neutrophil ratio (I:T Ratio): -Giemsa stained smears were scanned for wbc differential count, toxic granulation & cytoplasmic vacuolation.Immature neutrophils = band forms + myelocytes+ metamyelocytes + promyelocytes
- CRP was estimated by the semi quantitative latex agglutination method.

Criteria for Sepsis Screening[2,3]

- Leucopenia (TLC<5000/mm3)
- Neutropenia ANC < 1800/mm3
- Immature to total neutrophil ratio I:T ratio (≥ 0.20)
- Micro ESR- > 15 mm ist hour
- CRP + VE (≥ 1 mg/dl)

Table: Comparative analysis of efficacy of I:T ratio & CRP in Neonatal Sepsis

Total no. of cases = 150 (neonatal sepsis confirmed by culture; 130 cases + healthy controls; 20)	No. of cases with I:T ratio (≥ 0.20) = 112 cases	No. of cases with CRP(≥ 1 mg/ dl) = 116
Sensitivity	86.15%	89.23%
Specificity	95.23%	80%
Positive predictive value	99.11 %	95.86%
Negative predictive value	52.63%	58.82%

3. Discussion

The most useful and widely used test for neonatal sepsis is the white blood cell count and differential count. An absolute neutrophil count of < 1800 per cmm is an indicator of infection. Neutropenia is more predictive of neonatal sepsis than neutrophilia but it may be present in maternal hypertension, birth asphyxia and periventricular hemorrhage. Immature neutrophils (Band cells + myelocytes + metamyelocytes) to total neutrophils ratio (I/T) > 0.20

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means that immature neutrophils are over 20 percent of the total neutrophils because bone marrow pushes even the premature cells into circulation, to fight infection [4, 5, 6].

The sensitivity of CRP is **89.23 %** which is better than sensitivity I:T ratio**(86.15%)** but specificity of I:T ratio is **95.23%** which is much higher than the specificity of CRP.

Thus I: T is the single & most useful parameter for early diagnosis of neonatal sepsis. It has the reasonably good sensitivity & can predict neonatal sepsis early with reasonable accuracy. In this study I: T Ratio is more specific than CRP, thus it can more accurately be used for ruling out proven sepsis.

Another drawback of CRP is that it can be affected by asphyxia, shock, meconium aspiration and prolonged rupture of membranes [7].

4. Conclusion

It is well-known fact that understanding hematology of neonatal sepsis helps in early identification of suspected cases of neonatal sepsis. Amongst Hematological parameters immature to total neutrophil (I:T) ratio has a reasonably good predictive value for early diagnosis of neonatal septicemia. Reasonable clinical judgment with CRP and I:T Ratio provides rational bases for treatment decision in neonatal sepsis. Such strategy significantly reduces unnecessary antimicrobial therapy which can otherwise permit emergence of resistant strains.In this study I: T Ratio is more specific than CRP, thus it can more accurately be used for ruling out proven sepsis

A high index of suspicion with or without lab evidences of infection is the key for early diagnosis. Prompt institution of antibiotic therapy and supportive care will save most of the cases of neonatal sepsis

5. Funding

No funding sources

6. Conflict of interest

None declared

7. Ethical Approval

Not required

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