Int. J Med. Pharm. Res. (P-ISSN: 2958-3675 | E-ISSN: 2958-3683)
Available on: https://ijmpr.in/

International Journal
of Medical and Pharmaceutical Research

ORIGINAL ARTICLE **OPEN ACCESS**

Correlation of C-Reactive Protein and Blood Culture in Diagnosis of Neonatal Sepsis

Dr. Mohammed Shahnawaz[1]*, Dr. S. Pavani[2], Dr. V. Sudha Rani[3], Dr.NalamSaiPhani Vikas[4]

[1]Post Graduate, Department of Microbiology, Osmania Medical College, 5-1-876, Turrebaz Khan Rd, Troop Bazaar, Koti, Hyderabad, Telangana 500095, India
[2]Associate Professor, Department of Microbiology, Osmania Medical College, 5-1-876, Turrebaz Khan Rd, Troop Bazaar, Koti, Hyderabad, Telangana 500095, India
[3]Professor & Head of the Department, Department of Microbiology, Osmania MedicalCollege, 5-1-876, Turrebaz Khan Rd, Troop Bazaar, Koti, Hyderabad, Telangana 500095, India
[4]Final Year MBBS, Gandhi Medical College, Gandhi Hospital, Musheerabad, Padmarao Nagar, Secunderabad, Telangana 500003, India

OPEN ACCESS

***Corresponding Author**
Dr.Mohammed Shahnawaz

Post Graduate, Department of Microbiology, Osmania Medical College, 5-1-876, Turrebaz Khan Rd, Troop Bazaar, Koti, Hyderabad, Telangana 500095, India

Received: 28-05-2024
Accepted: 23-08-2024
Available online: 24-08-2024

A B S T R A C T

Introduction*:** Neonatal sepsis is a clinical syndrome of systemic illness accompanied by bacteraemia in thefirst 28 days of life (neonates). Early onset sepsis is the culture positive infection within the first 72hours of life while late onset sepsis is the culture positive infection after 72 hours of life.Materials and Methods*:** 166 neonates, of which 83 suspected of early neonatal sepsis and 83 suspected of late onsetsepsis were included in the study over a period of two months. Blood culture andqualitative assessment of CRP was done for all the subjects.***Results*:** Out of the 166 Neonates, 2(1.2%) were both Blood culture positive and CRP positive; 21(12.8%) were only Blood culture positive, CRP negative; 19(11.5%) were only CRP positive, Blood culture negative**.** Among 83 early onset sepsis cases, both CRP and blood culture was positive in 2(2.4%) cases. Blood culture alone was positive in 9(10.8%) cases and only CRP was positive in 19(22.8%) cases. Among 83 late onset sepsis cases, only Blood culture positive were seen in 14(16.8%) cases and only CRP was positive in 2(2.4%) cases**.** ***Conclusion*:** CRP plays a major role as acute phase reactant in diagnosis of early onset sepsis. But in lateonset sepsis, Blood culture plays a major role. So Blood culture is the gold standard fordiagnosis of neonatal sepsis.

Keywords: Low birth weight, Infections, Markers, Septicemia.

INTRODUCTION

Neonatal sepsis refers to an infection involving bloodstream in newborn infants less than 28 days old. Neonatal sepsis is divided into early-onset (if symptoms start before 72 h of life) and late-onset (if symptoms start afterward). Neonatal sepsis is the third leading cause of Neonatal Mortality accounting for 42% of early and 13% of overall neonatal mortality whereas Prematurity and Intra-partum complications are first and second respectively [1].

Early-onset infections are caused by organisms present in the maternal genital tract. It can occur due to ascending infection following rupture of membranes or during the passage of the baby through infected birth canal [2]. The associated factors for early onset neonatal sepsis include low birth weight (LBW), multiple per vaginum examinations and difficult or prolonged labour [3].

Late-onset septicemia is caused by organisms thriving in the external environment of the hospital. The infection is often transmitted through the hands of the care providers. The associated factors of late-onset sepsis include low birth

weight, low gestational age,lack of breastfeeding, superficial infections (pyoderma, umbilical sepsis), aspiration of feeds, disruption of skin integrity with needle pricks, and the use of intravenous fluids or central venous catheter [4].

CRP production is a non-specific response to disease and cannot be used alone as a diagnostic test for septicaemia. Along with clinical evidence of the disease, CRP provides good idea regarding septicaemia diagnosis [5]. C-reactive protein was first described by Tillet and Francis in 1930. They concluded that it is a protein that helps in complement binding to foreign or damaged cells in response to inflammation and rising to peak levels after fifty hours. [6]

The gold standard for diagnosis of sepsis is a positive blood culture. Definitive culture results take atleast48-72h, resulting in treatment delays. Hence, certain rapid diagnostic tests such as Creactive protein (CRP) acts as indirect markers and will help detect early neonatal sepsis [7].

AIM & OBJECTIVE

The Present study was carried out to compare the accuracy of CRP in the diagnosis of Neonatal septicaemia with blood culture.

MATERIALS AND METHODS

A study was done for the comparative analysis of CRP and Blood culture in the diagnosis of Neonatal sepsis. This is a Hospital based study conducted in Special Newborn Care Unit (SNCU) in Modern Government Maternity Hospital, Hyderabad (TG). Data Collection was done for a period of two months from April to May 2023.

All the Neonates admitted to the SNCU during the study period with suspected Neonatal sepsis and weighing >1500 grams were included in the study.

2.5ml of blood were collected from suspected cases of neonatal study and transported to Microbiology laband 0.5ml was used for the measurement of CRP. 2ml was inoculated into the blood culture bottles and after overnight incubation Blood culture bottles were examined for indicators of growth like turbidity, haemolysis or discrete colonies on the surface of sedimented red cells. If any of these were present subculture was done on to blood agar and MacConkey agar. If indicators of growth were not present primary subculture was done after 48 hours of incubation on blood agar and MacConkey agar. If no growth occurred on plates after overnight incubation, bottles were incubated further and observed daily for indicators of growth till 7 days. A final subculture was done at the end of day 7 or at appearance of indicators of growth which ever was earlier. The colonies grown on blood agar and MacConkey agar were identified by conventional methods according to the standard laboratory protocol, including colony morphology, Gram staining and biochemical reactions[8] C-reactive protein was estimated semi quantitatively by using the CRP latex kit manufactured by the Pathozyme diagnostics (P) Limited. The CRP latex reagent was standardized to detect serum CRP level of >=6 ug/ml, which was considered the lowest concentration of clinical significance. CRP level can be calculated in term of micrograms per ml by multiplying the highest dilution giving clear cut agglutination with a factor of 6.

RESULTS

During the study period, a total of 166 neonates with 83 early onset and 83 late onset suspected of septicaemia were included in the study. Information like Gender, Age, Birth weight were noted.

Table 1: Demographic Data of the Study Population

Demographic Details (n=100)	Number of Neonates
Gender	
Male	59.03%
Female	40.97%
Age	
Preterm (<37 weeks)	59%
Term (>37 weeks)	41%
Birth Weight	
Low birth weight	35%
Normal birth weight	65%

Results were categorized into 3 categories

Out of the 166 Neonates, 2(1.2%) were both Blood culture positive and CRPpositive; 21(12.8%) were only Blood culture positive, CRP negative; 19 (11.5%) were only CRP positive, Blood culture negative**.**

Table 2: Study variables in comparison between C – reactive protein and Blood culture

Both Blood culture positive and CRP positive	Blood culture positive	CRP positive
2 (1.2%)	23(13.8%)	21(12.6%)

Among 83 early onset sepsis cases, both CRP and blood culture was positive in2 (2.4%) cases Blood culture positive were seen in 9(10.8%) cases and only CRP was positive in 19(22.8%) cases.

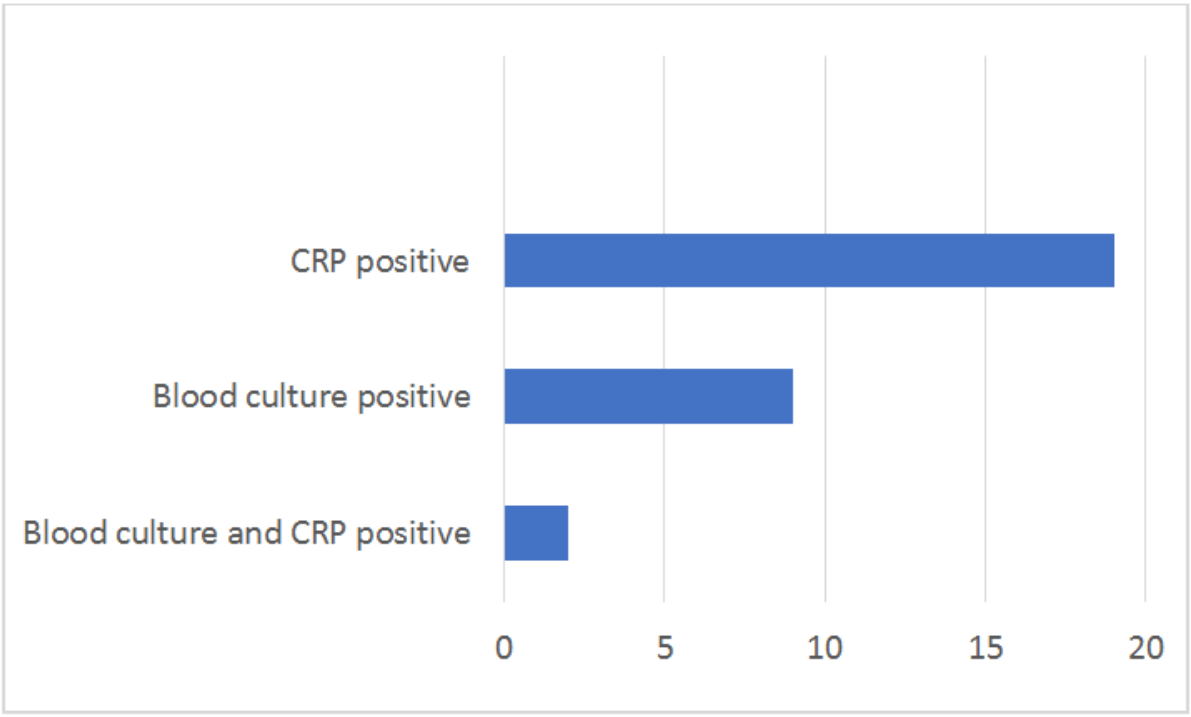

Figure 1: Early Onset Sepsis

Among 83 late onset sepsis cases, Blood culture positive were seen in 14(16.8%) cases andonly CRP was positive in 2 (2.4%) cases but it was noticed that no cases were seen where both blood culture and CRP were positive.

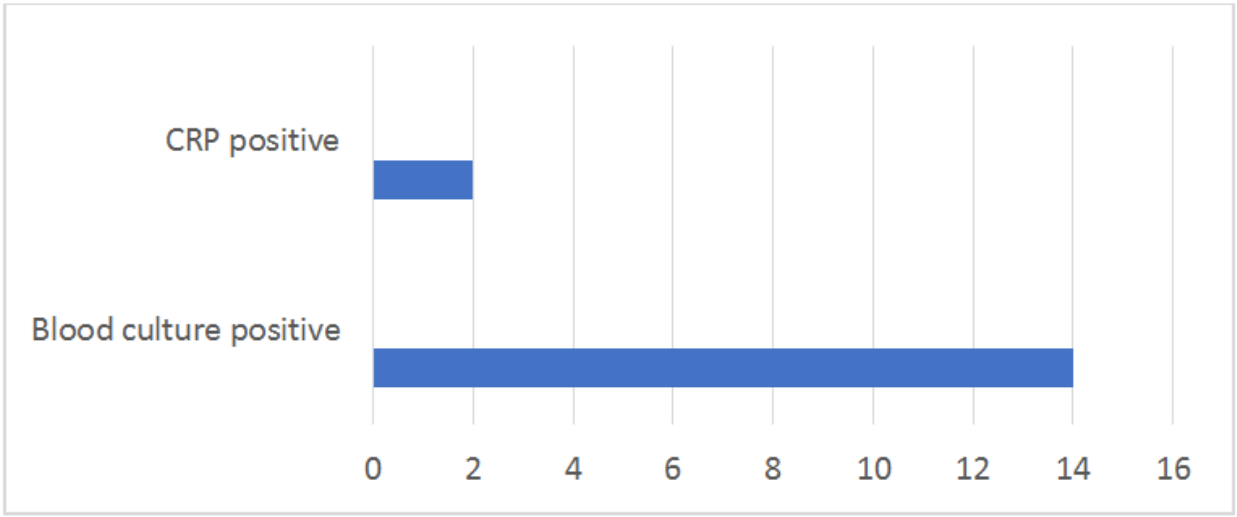

Figure 2: Late Onset Sepsis

Among Early onset sepsis cases the most common organism isolated was Escherichia coli(55%) followed by Klebsiella species (30%) followed by Staphylococcus aureus (15%) whereas in Late onset sepsis the most common organism isolated was Staphylococcus aureus (40%) followed by Klebsiella (35%)species followed by Escherichia coli (25%).

DISCUSSION

Among the newborns in the developing countries, Neonatal sepsis is considered as one of the leading causes of morbidity and mortality [9].

The present study was carried out in the Department of Microbiology in Modern Government Maternity Hospital, Hyderabad to compare the accuracy of CRP in the diagnosis of Neonatal septicaemia with blood culture.

In the present study, study group consists of 98(59.03%) males and (40.97%) females. Male babies were affected more than female babies similar to findings of other studies reported from India [10, 11].

In the present study, incidence of septicaemia was higher in preterm neonates (59%) compared to term neonates (41%). The results were consistent with studies conducted by Patel BM *et al*., [12] and Shah AJ *et al*., [13], who reported 67.37% and 70% blood culture positivity rates respectively in preterm babies. Preterm neonates are more prone to septicaemia because they have increased susceptibility to infection due to an immature immune system and inefficient neutrophil function [14-16].

The rate of infection is inversely proportional to birth weight. Low IgG levels are seen in neonates with low birth weightwhich makes them more susceptible to infections [17].

In the present study, out of 166 neonates suspected of neonatal septicaemia, 12.28% were blood culture positive. The results were comparable with many studies conducted in India [18-20]. Low blood culture positivity in the present study might be due to the possibility of infection with anaerobes or presence of fastidious organisms.

For definitive diagnosis of septicaemia, blood culture is the gold standard method but it takes at least 48-72 hours for reporting and by that time the infection may progress. especially if antibiotic treatment is not started. So there is a need of a screening test which can diagnose septic neonates rapidly and prevent injudicious antibiotic therapy in non septic neonates. CRP is a screening test that can be used to assess neonatal sepsis as it is easily available, cost effective and results are readily available [21].

CONCLUSION

CRP plays a major role as acute phase reactant in diagnosis of early onset sepsis along with blood culture. But in Late onset sepsis, Blood culture plays a major role. So Blood Culture is the Gold Standard for diagnosis of Neonatal Septicaemia.

REFERENCES

1. Zea-Vera, A., & Ochoa, T. J. (2015). Challenges in the diagnosis and management of neonatal sepsis. *Journal of tropical pediatrics*, *61*(1), 1-13.
2. Singh, M. (1999). "Perinatal infections," in Care of the Newborn, Singh, M. Ed., pp. 198–221, New Delhi, India, 5th edition,1999.
3. Chacko, B., &Sohi, I. (2005). Early onset neonatal sepsis. *The Indian Journal of Pediatrics*, *72*(1), 23-26.
4. Samanta, S., Farrer, K., Breathnach, A., & Heath, P. T. (2011). Risk factors for late onset gram-negative infections: a case–control study. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, *96*(1), F15-F18.
5. Celik, İ. H., Demirel, F. G., Uras, N., Oguz, S. S., Erdeve, O., Biyikli, Z., &Dilmen, U. (2010). What are the cut-off levels for IL-6 and CRP in neonatal sepsis?. *Journal of clinical laboratory analysis*, *24*(6), 407-412. doi: 10.1002/jcla.20420.
6. Mair, R. J., Joy, A. H., Finney, H., & Weaver, A. (2010). Creating an algorithm for requesting C-reactive protein in the emergency department. *European Journal of Emergency Medicine*, *17*(2), 125-126.doi: 10.1097/MEJ.0b013e3283366ceb
7. Dhanalakshmi, V., &Sivakumar, E. S. (2015). Comparative study in early neonates with septicemia by blood culture, staining techniques and c–reactive protein (CRP). *Journal of clinical and diagnostic research: JCDR*, *9*(3), DC12.
8. Collee, J G. (1996). Mackie and Mccartney Practical Medical Microbiology 14th Edition Elsevier 1996.
9. Behrman, R. E., Kleigman, R. M., & Jenson, H. B. (2004). Infections of the neonatalinfant. Nelson textbook of pediatrics. 17th edition. Philadelphia Saunders.623-640.
10. Rajendraprasad, B. P. M., Basavaraj, K. N., & Antony, B. (2013). Bacterial spectrum of neonatalsepticemia with their antibiogram with reference tovarious predisposing factors in a tertiary care hospital in Southern India. *Annals of Tropical Medicine and Public Health*, *6*(1), 96.
11. Sharma, A., Krishna Kutty, C. V., Sabharwal, U., Rathi, S. U. S. H. I. L. A., & Mohan, H. (1993). Diagnostic and prognostic role of CRP and m-ESRin neonatal septicemia. *Indian pediatrics*, 30, 347-347.

12. Rajendraprasad, B. P., Basavaraj, K. N., Antony, B., & Patel, B. (2013). Bacterial spectrum of neonatal septicemia with their antibiogram with reference to various predisposing factors in a tertiary care hospital in Southern India. *Ann Trop Med Public Health*, *6*(1), 96-99.
13. Shah, A. J., Mulla, S. A., &Revdiwala, S. B. (2012). Neonatal sepsis: high antibiotic resistance of the bacterial pathogens in a neonatal intensive care unit of a tertiary care hospital. *Journal of clinical neonatology*, *1*(2), 72-75.
14. Nagata, E., Brito, A. S., & Matsuo, T. (2002). Nosocomial infections in a neonatal intensive care unit: incidence and risk factors. *American journal of infection control*, *30*(1), 26-31.
15. Stoll, B. J., Hansen, N., Fanaroff, A. A., Wright, L. L., Carlo, W. A., Ehrenkranz, R. A., ... & Poole, W. K. (2002). Late-onset sepsis in very low birth weight neonates: the experience of the NICHD Neonatal Research Network. *Pediatrics*, *110*(2), 285-291.
16. Tsai, M. H., Chu, S. M., Lee, C. W., Hsu, J. F., Huang, H. R., Chiang, M. C., ... & Huang, Y. C. (2014). Recurrent late-onset sepsis in the neonatal intensive care unit: incidence, clinical characteristics and risk factors. *Clinical Microbiology and Infection*, *20*(11), 928-935.
17. Khatua, S. P., Das, A. K., Chatterjee, B. D., Khatua, S., Ghose, B., &Saha, A. (1986). Neonatal septicemia. *The Indian Journal of Pediatrics*, *53*, 509-514.
18. Paolucci, M., Landini, M. P., &Sambri, V. (2012). How can the microbiologist help in diagnosing neonatal sepsis?. *International journal of pediatrics*, *2012*(1), 120139.
19. Goswami, Y., Jadav, P., &Rathod, B. (2014). Study on significance of CRPestimation in early diagnosis of neonatal septicemia. *IJSR*, *3*(8), 388-390.
20. Hisamuddin, E., Hisam, A., Wahid, S., &Raza, G. (2015). Validity of C-reactive protein (CRP) for diagnosis of neonatal sepsis. *Pakistan journal of medical sciences*, *31*(3), 527-531.
21. Niza, M., Nitya, V., &Babita, S. (2018). Correlation of C-Reactive Protein and Blood Culture in Neonatal Sepsis, *6*(3), PO05-PO08.