ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(11): 889-891
www.allresearchjournal.com
Received: 12-08-2015
Accepted: 16-09-2015

Sohail S Khan
P.G. Department of Microbiology Shri Shivaji College of Arts, Comm. and Science, Akola, Maharashtra, India.

M Musaddiq
P.G. Department of Microbiology Shri Shivaji College of Arts, Comm. and Science, Akola, Maharashtra, India.

Correspondence
Sohail S Khan
P.G. Department of Microbiology Shri Shivaji College of Arts, Comm. and Science, Akola, Maharashtra, India.

Early Diagnosis of Neonatal Septicemia

Sohail S Khan, M Musaddiq

Abstract
Septicemia in neonates refers to generalized bacterial infection documented by positive blood culture in the first four weeks of life and is one of the four leading causes of neonatal mortality and morbidity in India, so the study is carried out by taking 175 neonates blood samples which were proceed by blood culture and sepsis screening for early diagnosis by hematological test, total 103 samples were found to be blood culture positive and in the screening of proven cases abnormal values were seen in Total leukocyte count 78 (75.7%), Neutrophils count 79 (76.6%), Hemoglobin level 48 (46.6%), Platelet count 38 (36.8%) positive C‾reactive protein was seen in 92 (89.3%), rise ESR level 25 (34.7%). The results showed that abnormal TLC count, Neutrophil count and positive CRP were significant for early diagnosis of neonatal septicemia.

Keywords: *Neonatal Septicemia, Heamatological test, sepsis screen.*

1. Introduction
Septicemia in neonates refers to generalized bacterial infection documented by positive blood culture in the first four weeks of life (Agnihotri *et al.,* 2004) [1] and is one of the four leading causes of neonatal mortality and morbidity in India (Tsering *et al*., 2011; Kumhar *et al.,* 2002) [9]. Neonatal septicemia continues to be a major problem for neonates in neonatal intensive care units around the world (Gomaa *et al.,* 2001) [6].
Neonatal septicemia is the commonest cause of neonatal mortality in the developing countries like India (Singh *et al.,* 1991) [17]. A total of 48.2% neonates had high-risk morbidities, which was nearly 10 times the neonatal mortality rate (NMR) of 52 per 1000, and 72% neonates had low-risk morbidities (Bang *et al*., 2001) [2]. These morbidities can cause death or long-term consequences in childhood and adulthood, making huge demands on family and on the health-care system. To compound the problem, most neonates in developing countries are born and cared for at home and cannot be taken for medical care even if sick (Bang *et al*., 1993).
The clinical diagnosis of neonatal sepsis is difficult because the signs and symptoms are not always specific. There is no laboratory test with 100% sensitivity and specificity.(Plazek *et al.,* 1983, Gluck *et al*., 1966) [5, 12] Blood culture has been considered the gold standard for confirmation of diagnosis but the results are available only after 48–72 hours. Moreover, in many cases blood culture fails to detect the offending organism/bacteria. The aim of the present study is to find out the relevance of sepsis screen tests in the diagnosis of neonatal sepsis.

2. Material and Methods
Patients: During a period of research work, a total of 175 neonates who admitted to the preterm unite and intensive care unit (ICU) in Akola city were investigated for early onset sepsis (0-7 days of age) and late onset sepsis (>7-90 days of age).

Blood Samples: Using aseptic conditions, by applying Povidone iodine and 70% alcohol at the site of vein puncture, 5 ml. venous blood was drawn from the antecubital or femoral vein. The specimens were gently poured in sterile tubes containing anticoagulant and transported within one hour to the Core Laboratory. The blood was divided in to two equal portions; 2.5 ml of blood were inoculated directly in brain heart infusion broth and incubated for 24 hr. for culturing assay and the remaining 2.5 ml blood were used for hematological testing's.

3. Results

Table 1: Table shows the frequency of isolated organism.

Sr. No.	Organisms Isolate	Frequency (n)
1	*K. Pneumoniae*	27
2	*S. aureus*	22
3	*Protius spp*	20
4	*E. coli*	14
5	*Pseudo. spp.*	12
6	*Citrobactor*	05
7	*Acinetobactor*	02
8	*Salmonella*	01

Table 2: Results of Other Tests in Probable and Proven Sepsis Cases.

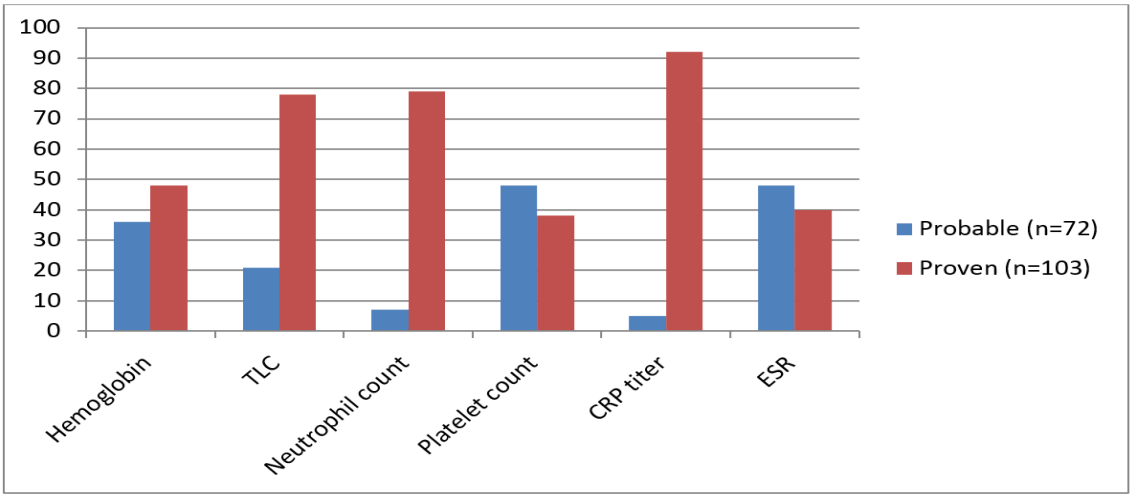
Sr. No.	Tests	Probable (n=72)	Proven (n=103)
1	Hemoglobin	36(50%)	48(46.6%)
2	TLC	21(29.1%)	78 (75.7%)
3	Neutrophil count	07(9.72%)	79(76.6%)
4	Platelet count	48(66.6%)	38 (36.8%)
5	CRP titer	05(6.9%)	92(89.3%)
6	ESR	66(64.07%)	25 (34.7%)

TLC- Total Leukocyte Count, ESR- Erythrocyte Sedimentation Rate.

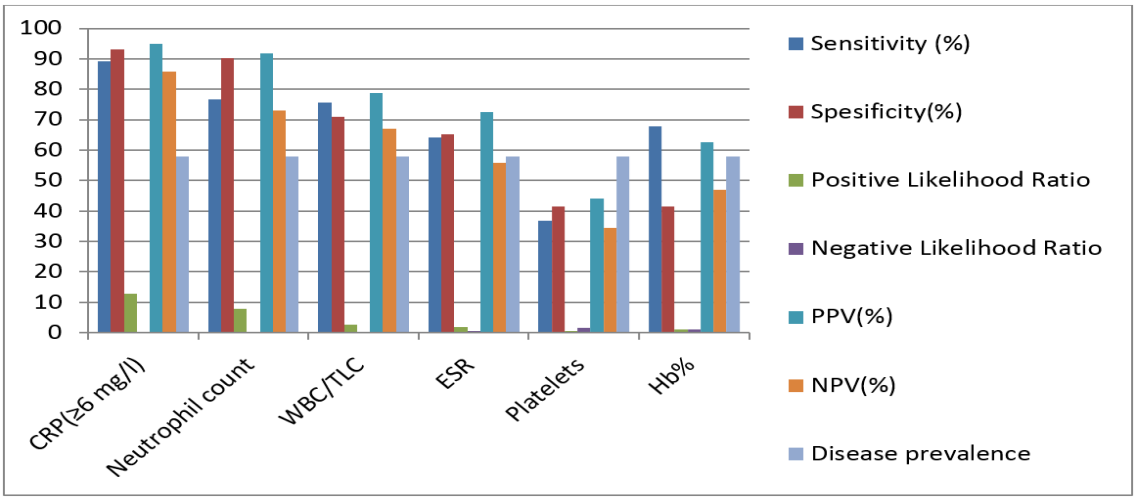
Table 2: Sensitivity, Specificity, and Positive Predictive Value and Negative Predictive Value of the Hematological Tests.

Hematological Tests	Sensitivity (%)	Specificity (%)	Positive Likelihood Ratio	Negative Likelihood Ratio	PPV (%)	NPV (%)	Disease Prevalence
CRP(≥6 mg/l)	89.32	93.06	12.86	0.11	94.85	85.90	58
Neutrophil count	76.70	90.28	7.89	0.26	91.86	73.03	58
WBC/TLC	75.73	70.83	2.60	0.34	78.79	67.11	58
ESR	64.08	65.28	1.85	0.55	72.53	55.95	58
Platelets	36.89	41.46	0.63	1.52	44.19	34.34	58
Hb%	67.9	41.6	0.97	1.03	62.5	47	58

CRP: C-reactive protein, PPV; positive predictive value, NPV; negative predictive value.



Graph 1: Hematological Tests in Probable and Proven Sepsis Cases.



Graph 2: The Graph Shows Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Values of the Hematological Tests

In the present study, of the 175 cases, 103 had positive blood culture reports (proven cases 58.8%). In the hematological screening of proven cases abnormal values were seen in Total leucocytes count 78 (75.7%), Neutrophils count 79

(76.6%), Hemoglobin level 48 (46.6%), Platelet count 38 (36.8%) positive C‑reactive protein was seen in 92 (89.3%), rise ESR level 25 (34.7%) [Table 2]. Among all the tests performed, five tests (CRP, m-ESR, WBC count, platelets count and neutrophils count) proved to be very useful tests to diagnose the early neonatal sepsis and test results were statistically significant [Table 3]. In the present study positive CRP value has the highest sensitivity (87%) and specificity (93.06%) as well as the highest positive predictive accuracy of 94.85%.

4. Discussion

Neonatal infection is one of the major problems in developing countries, including India. It is extremely important to make an early diagnosis of sepsis, because prompt institution of empirical antimicrobial therapy may be life‑saving.

The accuracy in making early diagnosis depends upon the sensitivity of the test employed. Philipson *et al*., 1957 [11] first described the presence of CRP in bacterial infection of neonates. Felix *et al*., 1966 [3] Hansoan *et al*., 1962 [7] and Siegel 1981 [16] observed that CRP increased invariably in neonatal infections and more consistently in septicemia and meningitis. Sabel *et al*., 1974 [13] in their study of 14 cases of neonatal septicemia and meningitis observed increased CRP in 85.7% of cases with positive bacterial cultures. Other workers Singh *et al.,* 1987 [18], Vyas *et al*., 1985 [21], Kalra *et al*., 1985 [8], found CRP is the most sensitive and specific test in distinguishing infected from non infected babies, in our study we had found that the CRP has a highest sensitivity 89.3% and relatively high specificity 93.06% with highest positive predictive value of 94.85% amongst the all hematological tests performed.

Combination of CRP with other tests also gave good results. CRP can be used to differentiate between positive and contaminated blood culture in children and has been shown to be a better predictor than white blood count (WBC) or absolute neutrophil count (ANC) for this purpose (Shaoul R, *et al.,* 2008) [14].

According to Shrestha P. *et al,* 2008 [15] severe bacterial sepsis may demonstrate an increase in TLC due to rise in mature and immature neutrophils, in this present study abnormal TLC was found 78 (75.7%) with 75.7% sensitivity and 70.8% specificity with 78.7% positive predictive value while abnormal neutrophil count had the highest sensitivity (76.7%) and specificity (90.2%) with (91.8%) positive predictive value.

5. Conclusion

In the view of changing spectrum of etiology and growing multidrug resistant neonatal sepsis pose a serious problem globally. Management of neonatal sepsis can be carried out by proper antenatal care, proper hand washing, and clean birth environment, clean cord care, and strict asepsis in nursery. According to present study CRP is a highest sensitive as well as specific test in the early detection of neonatal septicemia followed by the abnormal neutrophil count and total leukocyte count. Sepsis screen together with blood culture helps in diagnosis of neonatal sepsis.

6. References

1. Agnihotri N, Kaistha N, Gupta V. Antimicrobial susceptibility of isolates from neonatal septicemia. Jpn J Infect Dis. 2004; 57:273-5.
2. Bang AT, Bang RA, Baitule SB, Deshmukh MD, Reddy MH. Burden of morbidities and the unmet need for health care in rural neonates a prospective observational study in Gadchiroli, India. Indian Pediatr 2001; 38:952-65.
3. Felix NA, Nakajima H, Kagan BM. Serum C reactive protein in infections during the first six months of life. Pediatr, 1966, 37270.
4. Ghosh S, Mittal M, Jaganathan G. Early diagnosis of neonatal sepsis using a hematological scoring system. Ind J Med Sci. 2001; 55:495-500.
5. Gluck L, Wood HF, Fousek MD. Septicemia of the newborn. Pediatr Clin North Am 1966; 13:1131-47.
6. Gomaa HHA, Udo EE, Rajaram U. Neonatal septicemia in Al‑Jahrahospital, Kuwait: Etiologic agents and antibiotic sensitivity patterns. Med. Princ. Pract 2001; 10:145-50.
7. Hanson LA, nilson LA. Studies on C reactive protein during the pre and neonatal period. Acta. Path. Microbial. Seand 1962; 56:409.
8. Kalra K, Syam Sunder, Katra A, Ethence SR, Dayal RS. C - reactive protein in neonatal infections. Indian pediatr 1985; 22:215.
9. Kumhar GD, Ramachandran VG, Gupta P. Bacteriological analysis of blood culture isolates from neonates in a tertiary care hospital in India. J Health Popul Nutr. 2002; 20:343-7.
10. Misra RN, Jadhav SV, Ghosh P, Gandham N, Angadi K, Vyawahare C. Role of sepsis screen in the diagnosis of neonatal sepsis. Medical Journal of Dr. D.Y. Patil University. 2013; 6:3.
11. Philipson L, Tevtaras E. C- reactive protein in infancy. Its appearance during the first year of life, transplacental passage and electrophorotic pattern. Acta. Pediatr. Scand 1957; 46:1.
12. Plazek MM, White LA. Early and late neonatal septicemia. Arch Dis Child 1983; 58:728-31.
13. Sabel KG, Hanson LA. The clinical usefulness of C reactive protein determination in bacterial meningitis and septicemia in infancy. Acta. Pediatr. Scand 1974; 63:381.
14. Shaoul R, Lahad A, Tamir A, Lanir A, Srugo IC. Reactive Protein (CRP) as a predictor for the bacteremia in children. Med Sci Monit 2008; 14:255-61.
15. Shrestha P, Das BK, Bhatta NK, Jha DK, Das B, Setia A *et al*. Clinical and bacteriological profiles of blood culture positive sepsis in newborns. J Nepal Paediatr Soc. 2008; 27:64-7.
16. Siegel JO. Sepsis neonatorum. New Eng J Med, 1981, 304-642.
17. Singh M, Deorari AK, Paul VK. Perinatal mortility in a hospital. India J Med. 1991: 94(B):1-5.
18. Singh M, Narang A, Bhakoo ON. Evaluation of sepsis screening in the diagnosis of neonatal sepsis. Indian Pediatr 1987; 24:39.
19. Tsering DC, Chanchal L, Pal R, Kar S. Bacteriological profile of septicemia and the risk factors in neonates and infants in Sikkim. J Global Infect Dis., 3, 425.
20. Vergnano S, Sharland M, Kazembe P, Mwansambo C, Heath PT. Neonatal sepsis: An international perspective. Arch Dis Child Fetal Neonatal Ed 2005; 90:F220-4.
21. Vyas KP, Patel MP, Seth KR, Shaw RC. C- reactive protein in early diagnosis of neonatal sepsis. J. India, M.A. 1985; 83:408.