Original Research Paper

Volume - 12 | Issue - 01 | January - 2022 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Pathology

LABORATORY PARAMETERS FOR DIAGNOSIS OF SEPSIS IN NEONATES AND CHILDREN

Dr.Misha Antani — Senior Resident, Department of Pathology, Smt.N.H.L. Municipal Medical College, Ahmedabad, Gujarat.

Dr.Yukti Shah* — Consultant Pathologist, Department of Pathology, HCG Cancer Centre, Ahmedabad. *Corresponding Author

Dr.Anjali Goyal — Associate Professor, Department of Pathology, Smt.N.H.L. Municipal Medical College, Ahmedabad, Gujarat.

ABSTRACT **Background:** Neonatal sepsis is a clinical syndrome of Bacteraemia characterized by systemic sign and symptoms of infection in the first month of life. [1,2,3] Neonatal sepsis encompasses systemic infection of the new born including septicaemia, meningitis and pneumonia. [4] **Aims and objectives:** of this study are to know the predisposing factors, outcome and early detectors of sepsis and early diagnosis of sepsis by laboratory tests to prevent morbidity and mortality. **Results and conclusions:** In present study 57% were preterm, 85% were low birth weight, 36% neonates, 12% children were having Leukopenia and 40% neonates, 41% children were having leucocytosis. 76% of neonates were having thrombocytopenia and 42% children were having thrombocytopenia. CRP was positive in 88% of neonates and 53% of children, 62% patients were culture positive and maximum culture positive cases were seen in neonates less than 3 days old. Hence preterm neonates, low birth weight neonates are at higher risk of neonatal sepsis. For diagnosis of neonatal sepsis blood culture is gold standard but culture positivity rate is low and time consuming while CRP and haematological parameters are easily available, cost effective and rapid.

KEYWORDS : sepsis, low birth weight, CRP, blood culture

INTRODUCTION

Sepsis in neonates and children is difficult to diagnose from other conditions, because clinical signs are non specific. It is a common cause of morbidity and mortality amongst neonates and children in NICU and PICU. Delay of few hours in initiating treatment can increase morbidity and mortality. Conventional methods do not provide rapid diagnosis so there is a need for rapid diagnostic tests to initiate early and prevent mortality and morbidity. This study was under taken to know the predisposing factors, outcome, and early indicators of sepsis. Neonatal sepsis is a clinical syndrome of bacteraemia characterized by systemic signs and symptoms of infection in the first month of life. Neonatal sepsis encompasses systemic infections of the new-born including septicaemia, meningitis and pneumonia. Neonatal sepsis can be divided into two main classes depending on the onset of symptoms related to sepsis. Early onset sepsis usually presents within the first 72 hours of life. Late onset sepsis usually presents after 72 hours of life. [1,2,3]. Perinatal Risk factors for neonatal sepsis included low birth weight, Prematurity, Birth asphyxia and Instrumentation. Clinical features for neonatal sepsis included poor feeding, lethargy and reduced activity, hypothermia/ fever, Jaundice, apnoea, seizures. Sepsis in paediatric age group is likely due to result of sequence of disorders that is due to infection by viruses, bacteria, parasite, fungi or toxins of organisms. The outcome is improved with early recognition and resuscitation of sepsis and septic shock in the golden first few hours of PICU admission. Clinical features of sepsis in children included fever, urine infection and hypotension. Lab findings of sepsis in children commonly seen are decreased platelet count, prolonged prothrombin and partial thromboplastin time, decreased fibrinogen, increased fibrin degradation products,anemia, elevated neutrophil count and increased immature forms,,vacuolation, toxic granules, dohle bodies,

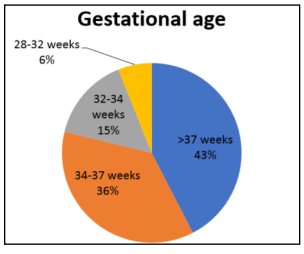
MATERIALAND METHODS

A retrospective observational study from medical records and laboratory parameters was conducted on patients admitted at tertiary care hospital of 50 patients up to 14 years of age. A minimum of 50 patients of sepsis over a period of six months admitted to the hospital were divided into two groups: 33 cases of neonates (up to 28days), 17 cases of children (1-14 years old) were selected. The data for this study was collected by patient evaluation which was done by detailed history taking, Clinical examination and relevant investigations using a pro forma specially designed for this study. Total leucocyte count, Platelet count, CRP and Blood culture were performed in all patients. Neonates and Children (<14 Years) with sepsis were included with neonates presenting with perinatal risk factors and clinical risk factors. Children >14 years of age, clinically not suspected sepsis in neonates and children and patients who receive antibiotics prior to admission were excluded from this study.

RESULTS

Total 50 patients of sepsis were diagnosed fulfilling inclusion criteria. Patients were classified on the basis of age where neonates (<1 month of age) were 33 and children (1 year – 14 years) were 17 in number.

Graph 1: Distribution Of Cases According To Gestational Age In Neonates:



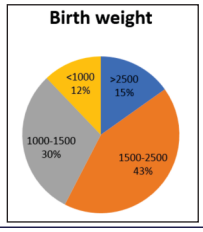
In present study out of 33 neonates, 43% were term and 57% were preterm. (6% cases were early, 15% cases in middle and 36% cases were in near term category).

IgG is actively transported across the placenta which starts around 22 weeks of gestation, with concentration in a full term neonate comparable with mother's serum. In preterm cord IgG levels are directly proportional to gestational age. Thus premature are extremely vulnerable to infection because of their inherent compromised immunity, vulnerable skin and mucosal barrier, prolonged hospital stay and extensive interventions for other complications of prematurity.

Table 1: Distribution Of Cases According To Birth Weight In Neonates

Weight on admission	Number of patients
More than 2500 gm.	05 (15%)
2500 gm-1500 gm.	14 (43%)
1500 gm-1000 gm.	10 (30%)
Less than 1000 gm.	4 (12%)

Graph 2



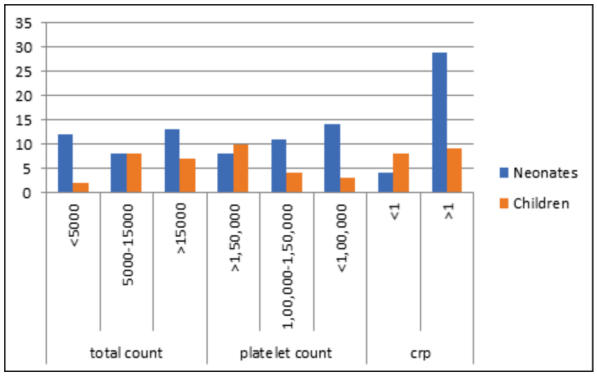
28 neonates were low birth weight (<2500 gm.), the average birth weight was 1635.7 gm. Thus the present study has a significant preponderance for low birth weight 85% being low birth weight.

Low birth weight infants, both premature and term small for date infants have low IgG and they are more susceptible to infections.

Table 3: Distribution Of Cases According To Total Leucocyte Count, Platelet Count And CRP

Total leucocyte count				Platelet count			CRP	
	<5000	5000-15,000	> 15,000	>1,50,000	1,00,000-1,50,000	<1,00,000	<1	>1
Neonates	12 (36%)	8 (24%)	13 (40%)	8 (24%)	11 (33%)	14 (43%)	4 (12%)	29 (88%)
Children	2 (12%)	8 (47%)	7 (41%)	10 (59%)	4 (24%)	3 (18%)	8 (47%)	9 (53%)

Graph 3



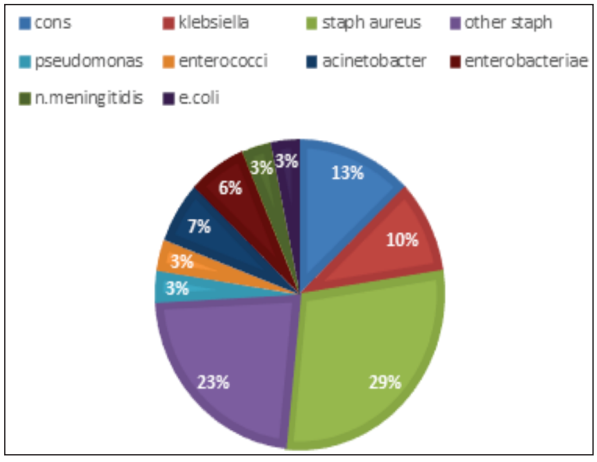
36% neonates, 12 % children were having leukopenia and 40% neonates, 41 % children were having leucocytosis.

Thrombocytopenia (platelet count<1, 50,000) was seen in 76% of neonates and 42 % of children. Thrombocytopenia is a positive predictor of sepsis. Chi square test was applied and p value is <0.05. there is significant association of thrombocytopenia with sepsis in children and neonates.

CRP was positive in 88% of neonates and 53% of children Chi square test was applied and p value <0.05. There is significant association between CRP and sepsis.

Among 50 patients 62% patients were culture positive and 38% were culture negative. Though blood culture is the "GOLD STANDARD" for the diagnosis of sepsis, it may be negative in large number of cases reason being, Wrong collection technique, Wrong storage technique, Difficulty in isolating fastidious organisms, Prior antibiotic therapy, Laboratory facility

Graph 4: Distribution of cases according to organisms isolated



Staph aureus (18%) and other staph (14%) were the predominant organisms causing septicaemia followed by CONS (8%) and klebsiella (6%).

DISCUSSION

Results in the present study shows Thrombocytopenia, Leucocytosis, Positive CRP and Positive blood culture as predictor of sepsis in neonates and children both, while preterm and low birth weight neonates also shows higher preponderance to sepsis.

Pre term neonates are prone to sepsis. 57 % preterm neonates were having sepsis in present study. Our findings were similar to Tallur et al[9] where 60% cases were term babies and 40% were preterm babies.

As like present study 85% low birth weight neonates having sepsis ,other studies have also shown preponderance for the low birth weight, Malik et al[10] reported 57.66% incidence of low birth weight and Bhakoo et al[11] reported 77% incidence of low birth weight and Tumkur reported 72.5% incidence of low birth weight in neonatal sepsis.

Tallur et al[9] reported 64.87% blood culture positivity and Guha et al[16] reported 40% culture positivity in neonatal sepsis. Though blood culture is the "GOLD STANDARD" for the diagnosis of sepsis, it may be negative in large number of cases. Karthikeyan et al[12] reported that Staphylococcus aureus was the predominant pathogen followed by Klebsiella pneumoniae which correlates well with our present study. Renuka Mohanty et al[13] reported that staphylococcus aureus is a major cause of neonatal septicaemia. Roy et al [14]observed that the most frequent offender in neonatal sepsis were Klebsiella species followed by Enterobacter species, Coagulase negative staphylococci, Staphylococcus aureus and Escherichia coli. Mandira Banerjee et al [15] reported an outbreak of neonatal septicaemia with multi drug resistant Klebsiella pneumoniae.

CONCLUSION

- Septicaemia is a leading cause of mortality and morbidity in neonates and children in our country.
- Prematurity and low birth weight neonates are at significant risk factor for development of sepsis.
- Blood culture though gold standard, culture positive rate is low.
- Sepsis screening parameters using CRP, haematological parameters are easily available, cost effective, rapid screening tests.
- Early diagnosis will help the clinician to institute the antibiotics promptly who will help in reducing the morbidity and mortality.

REFERENCES

1. Klein Jo et al, Bacterial Sepsis & Meningitis, Infectious disease of the fetus & newborn infant. Eds Ramingtons JS, Klein JO. Philadelphia WB Saunders Co, 1990, Pg. 601-656
2. Silverman WA, Homan WE, Sepsis of obscure origin in new born, Pediatrics, 1959. Volume 3
3. Gottof SP & Behrman PE: Neonatal Septicemia, J. Pediatrics; 76: 142-153, 1970.
4. Guha D.K., Outcome of Neonatal Septicemia: A clinical & bacteriological Profile. Indian J. Pediatrics, 1978; 15: 423-427.
5. David B. Haslam, Nelson textbook of Pediatrics Volume 1. 21st Edition, 996-1008.
6. Paul V.K. & Singh M, Medical emergencies in children. Sagar publications, 2nd edition, Page.115-132.
7. Gerdes JS, Polin R. Early diagnosis & treatment of neonatal sepsis, Indian J. Paediatrics, 1998; 65: 63-78.
8. Monroe et al. The neonatal blood count in health & disease, J Paediatrics, 1979; 95:89-98.
9. Tallur SS, Clinico bacteriological study of Neonatal Septicemia in Hubli, Indian J Paediatrics, 1998; 169-174.
10. Malik A et al. Nosocomial infections in Newborns. Indian Paediatrics, 2001; 38: 68-71.
11. Bhakoo et al, Prognosis & treatment of Neonatal Septicemia – A Clinico-Bacteriological study of 100 cases, Indian Paediatrics, 1974; 11: 519-528.
12. Karthikeyan G., Premkumar K : Neonatal sepsis – Staphylococcus aureus as the predominant pathogen. The Indian Journal of Paediatrics, Vol. 68, Issue 8, Pg. 715 – 717, 2001
13. Renuka Mohanty, Subhranshu Sekhar Kar : Rold of clinical signs in the diagnosis of late onset neonatal septicemia. Proceedings of the conference PEDICON 2004, Pg 186.
14. I Roy, A. Jain, M. Kumar, SK Agarwal : Bacteriology of neonatal septicemia in a tertiary care hospital of northern India. Indian Journal of Medical Microbiology. Vol.20(3): pages 156 – 159, 2002
15. Mandira Banerjee, Krishna Sahu, S. Bhattacharya, sati Adhya, P. Bhownick and P. Chakraborty : Outbreak of Neonatal septicemia with multi drug resistant klebsiella pneumoniae. Indian Journal of Pediatrics. Vol.60: pages 25 – 27, 1993.
16. Guha D.K., Outcome of Neonatal Septicemia: A clinical & bacteriological Profile. Indian J. Paediatrics,1978; 15: 423-427.