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Original Research Article

A Clinical Study on the Diagnostic Significance of Sepsis Marker in Neonatal Sepsis in Tertiary Care Centre of Andhra Pradesh

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Abstract:

Background: Neonatal sepsis is one of the major causes of death in infants because most sepsis is concealed and has to be evaluated hematologically and pathologically; hence, the diagnosis and treatment of neonatal sepsis remain a great challenge to pediatricians.

Method: 100 (one hundred) neonatal sepsis cases were studied. Apart from a detailed history of sepsis, blood examinations (CBC, CRP, and blood culture) were carried out to evaluate the specificity and sensitivity. Moreover, the level of TLC was correlated with CRP and different types of sepsis to find out the severity of sepsis.

Result: In the study of risk factors, 34% of PROM was followed by 20% of sepsis due to repeated vaginal examination. The major manifestation was 62% shock and 9% congenital pneumonia. In the organism study, 4% E. coli, 3% Klebesiella, and 7% staptocacal species were observed. In a correlative study, TLC with sepsis and CRP had a significant p value ($p<0.001$).

Conclusion: It is concluded that early sepsis is more common than the late onset of sepsis. Total WBC platelet CRP values are elevated and significant parameters to determine the severity of neonatal sepsis.

Keywords: early-onset sepsis (EOS), late-onset sepsis (LOS), c-reactive protein (CRP), leukocytes, Andhra Pradesh.

Introduction

Early onset of sepsis (EONS) was observed in 8–10 live births in 1000 cases, but 55.4% of overall sepsis is reported in neonates, and neonatal sepsis is one of the major causes of neonatal deaths [1]. Neonatal sepsis is broadly classified into early-onset neonatal sepsis (EONS), in which sepsis develops within three days after birth; pathogenesis is from the genital tract or delivery room; and late-onset neonatal sepsis (LONS) [2].

Sepsis occurs after 3 days of birth. The infection may be from the hospital or the community. As per the clinical manifestation, sepsis is again divided into two categories. Non-specific in which signs of sepsis are concealed and have to be diagnosed by hematological, pathological, and physical examination [3]. In specific sepsis, the sepsis can be ruled out by physical examinations like CNS, CVS, and GIT. Above all, investigations can finalize the severity of sepsis [4].

Hence, an attempt is made to study the distribution and manifestation of sepsis in organisms by culture.

TLC and CRP levels are correlated with types of sepsis. So that any sepsis can be treated efficiently to avoid morbidity and mortality,

Material and Method

100 (one hundred) babies admitted to the NICU government medical college hospital in Ongole, Andhra Pradesh 523001 were studied.

Inclusive Criteria: Babies <28 days of age with sepsis risk factors and having the clinical features of sepsis and parents or guardians given written consent for study were selected for study.

Exclusion Criteria: Babies having birth asphyxia birth weight < 1500 grams gestational age<32 weeks and neonates already treated with antibodies were excluded from the study.

Method: Out of 100 neonates, 57 were from caesarean sections and 43 were from normal vaginal delivery. Detailed history of suspected sepsis clinical features was noted in the Proforma.

Blood investigations included CBC and CRP. Blood culture was studied to evaluate the specificity, sensitivity, and positive predictive value of sepsis markers (total leucocyte count, CRP, and platelet count), and significant findings were noted.

The duration of the study was June 2023 to May 2024.

Statistical analysis: Various parameters of neonatal sepsis were analyzed with the chi-square and Anova tests. The statistical analysis was carried out in SPSS software. The ratio of male and female neonates was 2:1.

Observation and Results

Table 1: Distribution of risk factors for sepsis: 20 (20%) single unclear or more than 3 vaginal examinations, 34 (34%) PROM more than 18 hours, 21 (21%) Meconium stained liquor, 17 (17%) febrile illness in mother, 8 (8%) foul smelling labour.

Table 2: Manifestations of sepsis 82 (82%) shock, 9 (9%) congenital pneumonia, 5 (5%) Necrotizing enterocolitis, 4 (4%) meningitis

Table 3: Distribution of cases based on organism in culture: 1 (1%) Actinobacter species, 4 (4%) E. coli, 1 (1%) Haemophilus, 3 (3%) Klebsiella, 1 (1%) methicillin resistant staphylococcal aeurus, 1 (1%) pseudomonas aerugoinsia, 7 (7%) staphylococcus species

Table 4 (a): Correlation of total Leucocyte count V/s Neonatal sepsis mean TLC

12515.09 (± 25) suspected sepsis, 7855.17 (±48) probable sepsis, 7805.5 (±55) was culture proven sepsis has highly significant p value

Table 4 (b): Prediction of sepsis with total leucocyte count 33.3% sensitivity, 24.4% specificity, 88% PPV, 82.5% NPV

Table 5 (a): Correlation of mean CRP levels V/s Neonatal sepsis

14.47 (± 6.8) suspected sepsis, 48 (±28.8) probable sepsis, 78.17 (±35.4) was culture proven sepsis has highly significant p value ($p<0.01$)

Table 5 (b): Prediction of sepsis by CRP 83.3% sensitivity, 9.8% specificity, 16.9% PPV, 72.7% NPV.

Table 1: Distribution of Risk Factors for sepsis

Risk factors for sepsis	No. of cases	Percentage
Single Unclean or More than 3 Vaginal Examinations	20	20
PROM more than 18hrs	34	34
Meconium Stained Liquor	21	21
Febrile illness in mother	17	17
Foul smelling Liquor	8	8
Total	100	100

Table 2: Manifestation of sepsis

Manifestation of sepsis	No. of cases	Percentage
Shock	82	82
Congenital pneumonia	9	9
Necrotizing enterocolitis (NEC)	5	5
Meningitis	4	4
Total	100	100

Table 3: Distribution of cases based on Organisms in culture

Organisms	No. of cases	Percentage
Actinobacter species	1	1
E. coli	4	4
Haemophilus	1	1
Klebsiella	3	3
Methicillin-resistant staphylococcal aureus	1	1
Pseudomonas aerugonsia	1	1
Staphylococcal species	7	7
Total	18	18

Table 4 (a): Correlation of mean total Leucocyte count (TLC) vs Neonatal sepsis

		N	Mean (±) SD	95% confidence interval for mean		P value
				Lower Bound	Upper Bound	
Mean TLC	Suspected	53	12515.09 (±2554.73)	11810.92	13219.27	0.0001 (Highly significant)
	Probable	29	7855.17 (±4868.6)	6003.26	9707.09	
	Culture proven sepsis	18	7805.56 (± 5534.11)	4953.50	10557.6	
	Total	100	10316.00 (± 4571.64)	9408.89	11223.1	

Table 4 (b): Prediction of sepsis with Total leucocyte count

Sensitivity	33.3%
Specificity	24.4%
PPV	8.8%
NPV	62.5%

PPV = Positive predictive value, NPV = Negative predictive value

Table 5 (a): Correlation of mean CRP levels vs Neonatal sepsis

		N	Mean (±) SD	95% confidence interval for mean		P value
				Lower Bound	Upper Bound	
Mean CRP	Suspected	53	14.47(±6.863)	12.58	16.36	0.0001 (Highly significant)
	Probable	29	48.00(±28.864)	37.02	58.98	
	Culture proven sepsis	18	78.17(± 35.499)	60.51	95.82	
	Total	100	35.66(± 33.019)	29.11	42.21	

Table 5 (b): Prediction of sepsis by CRP

Sensitivity	53.3%
Specificity	9.8%
PPV	16.9%
NPV	72.7%

PPV = Positive predictive value, NPV = Negative predictive value.

Discussion

Present is a clinical study on the diagnostic significance of sepsis markers. neonatal sepsis in tertiary care centers of the Andhra Pradesh population. In the present study, 57% of births were by cesarean section, 43% by normal vaginal delivery. The risk factors for sepsis were 20% single unclean or more than 3 vaginal examinations, 34% by PROM more than 18 times, 21% by meconium stained liquor, 17% febrile illness of the mother, 8% foul-smelling (Table 1).

The manifestations of sepsis were 82% shock, 9% congenital pneumonia, 5% necrotizing enterocolitis, and 4% meningitis (Table 2). The organisms observed in neonatal sepsis were 7% staphylococcal sepsis, 4% E. coli, and 3% Klebsiella (Table 3). In a correlative study of mean total leucocyte count (TLC), different types had a significant p value ($p<0.001$), sensitivity was 33%, specificity was 24.4%, PPV was 8.8%, and NPV was 62% (Table 4). In a correlative study, the mean CRP with different types of sepsis had a significant p value ($p<0.001$) (Table 5). These findings are more or less in agreement with previous studies [5,6,7]. The pathogenesis of early-onset neonatal sepsis invades the umbilical cord, dermis, or mucosal surface, which can turn into severe infection with deterioration of condition soon after delivery or within three days after birth. Premature or low-birth babies are also more prone to the early onset of neonatal sepsis [8].

In late-onset sepsis, low birth weight (<2500 gms), preterm labor, admission to the ICU, mechanical ventilation, and invasive procedures such as the administration of parental fluids. In non-specific sepsis, hypothermia, weak cry, poor feeding, reduced perfusion, decreased muscle tone, neonatal reflux, tachycardia, bradycardia, apnea, hypoglycemia, or hyperglycemia [9].

CRP was positive in 89% A high result is a sign of inflammation. It may be due to the serious infection, injury, or chronic disease associated with an acute bacterial infection. It is a strong predictor of severe viral respiratory infection, particularly influenza virus and adenovirus pneumonia [10].

Total leucocyte count of the present study was also observed in previous studies [11]. Elevated leucocytes (WBC) indicate infection, inflammation, injury, or immune system disorders. Even a decrease WBC makes them more vulnerable to developing infection; hence, the WBC marker in the present study is a proper prognostic factor for the diagnosis of the degree of neonatal sepsis [12]. The aggravating factors for neonatal sepsis were the ill-health of the mother and unhygienic

domestic delivery. Nutritional status of pregnancy and the socio-economic status of parents.

Summary and Conclusion

Present clinical study on the diagnostic significance of sepsis markers in neonatal sepsis in the Andhra Pradesh population. The parameters like elevated leucocytes (WBC) and CRP correlation have significant results and positive markers to treat neonatal sepsis, but the present study demands that such clinical trials be conducted in a large number of neonates in a high-tech hospital to combat any adverse reactions and confirm the present significant finding because the exact pathogenesis of neonatal sepsis is still unclear.

Limitation of study: Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

This research paper has been approved by the ethical committee of Government Medical College, Ongole Andhra Pradesh-523001

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