Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

The Clinical and Experimental Characteristics of Neonates with Culture Positive Sepsis: A Study

Mohan Amgothu[1], Vura U. V. Naga Jyothi[1], Tikka Naveen Kumar[1], Karunakar Gare[1], Syed Khaja Waheed Hussain[2], G. Pratap[3]

[1]Assistant Professor, Department of Pediatrics, Kakatiya Medical College, Warangal, Telangana, India.
[2]Post Graduate, Department of Pediatrics, Kakatiya Medical College Warangal, Telangana, India
[3]HOD & Professor, Department of Pediatrics, Kakatiya Medical College, Warangal, Telangana, India

Abstract

Background: To assess the factors in cases of infant sepsis tested positive for culture: laboratory and clinical profile, receptivity to antibiotic therapy, prevalence of problems, and outcomes.

Material and Methods:A cross sectional analytical study included 123 neonates who met inclusion criteria. Basic data, demographic characteristics, mother risk factors, gestational age, clinical characteristics at manifestation, lab results, medication course and reaction, any problems and supportive treatments, and outcome were all collected in depth from the case file. Tableau software was used to examine the data.

Results: In study, sept 2021 had 17.9% of newborns, while nov 2021 had 15.4%. 75.6% of babies were born in government hospitals, 24.4% in private. Normal-weight babies were 50.4% and macrosomia 0.8%. 65.1% were outborn, 34.9% were inborn. Most in 37-38 weeks (23%), least in 32-33 (0.8%). Oligohydramnios was the largest risk factor at 64.2%, while PROM was 10.5%. Meropenem demonstrated 69.9% sensitivity, cefepime 66.6%, vancomycin and azithromycin 0.8%.

Conclusion: The study highlights patients with suspected sepsis in newborns and earlier antibiotic therapy for improved results. In culture-positive instances, hypoglycemia, apnea, seizures, DIC, and respiratory distress are common and must be actively handled.

Keywords: Neonatal sepsis, gestational age, antibiotics, blood culture.

Corresponding Author: Dr. Karunakar Gare, Assistant Professor of Pediatrics, Kakatiya Medical College, Warangal, Telangana, India. Email:drkanna4@gmail.com

Introduction

Sepsis kills 30-50% of infants in developing countries each year. 1% of newborns die from sepsis. Antimicrobials and supportive treatment prevent sepsis-related mortality. Neonatal sepsis is an infection in a newborn's first month. Neonatal sepsis encompasses meningitis, pneumonia, arthritis, osteomyelitis, and UTI.[1,2]

Classifying neonatal sepsis- Symptoms define neonatal sepsis. Septicaemia: Within 72 hours of birth, sepsis develops. In severe cases, newborns may show signs in utero (foetal tachycardia, low beat-to-beat variability) or hours after birth. Uterine infections are common. Neonatal pneumonia and respiratory distress are prevalent. Early-onset sepsis has a perinatal relationship. Developed countries start antibiotics with 2 risks. Neonatal sepsis is treated with antibiotics if there is foul-smelling liquor or three risk factors. 2 risk factors necessitate septic treatment.[2-4]

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

These risk factors cause early-onset sepsis are, Preterm or low birthweight, feverish mother 2-weeks before birth, Meconium-stained amnio, >24-hour membrane rupture, vaginal examinations during labour, Prolonged instrument delivery, Perinatal asphyxia or difficult resuscitation.[4-6]

72-hour LOS- Nosocomial (hospital-acquired) or community-acquired neonatal LOS infections cause septicemia, pneumonia, or meningitis. Low birth weight, prematurity, ICU hospitalisation, mechanical ventilation, invasive procedures, parenteral fluids, and stock solutions enhance nosocomial sepsis risk. Poor sanitation, cord care, bottle-feeding, and prelacteal meals may promote community-acquired LOS. Mild, generic symptoms make early diagnosis difficult. Neonatal sepsis symptoms may include: Hypothermia or fever (common in preterm low birth weight newborns); lethargy, poor cry, unwillingness to feed; poor perfusion, extended capillary refill time. Hypotonia, absent newborn reflexes; Brady/tachycardia; respiratory distress, apnea Hypoglycemia.[6-8]

Material and Methods

An analytical study using a cross-sectional design, will be conducted at Kakatiya Medical College, Warangal, Telangana, India, between September 2021 and September2022. There were 123 newborns included in the study because they fulfilled the inclusion criteria. In-depth data collection from the case file included basic data, demographic features, mother risk factors, gestational age, clinical characteristics at manifestation, laboratory results, medication course and reaction, any issues and supportive treatments, and outcome. In order to analyse the data, the Tableau software was utilised.

Inclusion criteria

All instances of newborns hospitalized to the NICU who had a positive blood culture and whose parents consented to their participation in the study either orally or in writing.

Exclusion criteria

Any cases of NICU hospitalized newborns with sterile blood culture or any cases in which the patient's parent(s) did not provide consent to participate in the study.

RESULTS

Table 1: Monthwise distribution

Month/ Year	Frequency	Percentage
Sept -2021	22	17.9
Oct -2021	20	16.3
Nov -2021	19	15.4
Dec -2021	8	6.5
Jan -2022	13	10.6
Feb -2021	41	33.3

In sept 2021 highest percent of newborn were seen (17.9), while nov 2021 showed 15.4 participants.

Table 2: Distribution of institute of delivery

Hospital of Delivery	Frequency	Percent
Government	93	75.6
Private	30	24.4

75.6 % newborns were delivered at government hospital and 24.4 % at private.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 3: Birth weight wise distribution

Birth Weight	Frequency	Percent
Extremly Low Birth Weight	3	24
Very Low Birth Weight	12	9.8
Low Birth Weight	45	36.6
Normal Weight	62	50.4
Macrosomia	1	0.8
Total	123	100

Babies with normal weight was 50.4% and lowest with macrosomia 0.8%

Table 4: Type of admission distribution

Facility	Frequency	Percent
Outborn	80	65.1
Inborn	43	34.9

65.1 % were out born cases and 34.9 % were inborn.

Table 5: Weeks of gestation distribution

Gestational Age	Frequency	Percent
28-29 weeks	4	3.2
29-30 weeks	3	2.4
30-31 weeks	3	2.4
31-32 weeks	4	3.3
32-33 weeks	1	0.8
33-34 weeks	2	1.6
34-35 weeks	5	4.1
35-36 weeks	16	13
36-37 weeks	23	18.7
37-38 weeks	29	23.6
38-39 weeks	15	12.2
39-40 weeks	13	10.6
40-41 weeks	5	4.1

Most number present in 37-38 weeks with 23% while least was in 32-33 week with 0.8%

Table 6: Gestational age distribution

Gestational Age	Frequency	Percentage
Preterm	61	49.6
Term	62	50.4
Post term	0	0.0

49.6 % were preterm and 50.4 % babies were term. No post term were observed.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 7: Maternal risk factors distribution

Maternal Risk Factor	Frequency	Percent
No risk factors	79	64.2%
Oligohydramnios	14	11.3%
Prom	13	10.5%
Hypothyroidism	8	6.4%
Eclampsia, preeclampsia	4	3.2%
Rh negative pregnancy	3	2.4%
Chorioamnionitis	2	1.6%
GDM	2	1.6%
UTI	2	1.6%
Maternal fever	2	1.6%
Polyhydramnios	2	1.6%
Anemia	1	0.8%
Cervical incompetence	1	0.8%
HbSAg positive	1	0.8%
Prolonged labour	1	0.8%
Placenta previa	1	0.8%
Malaria	1	0.8%

Oligohydramnios was highest with 64.2% as risk factor and PROM was 10.5%. whereas 79 showed no risk factors involved.

Table 8: Reasons for admission/referral distribution

Complaints at Admission	Frequency	Percent
Respiratory Distress	62	5.4
Dull Activity	23	18.6
Low Birth Weight	16	13
Delayed Cry	15	12.1
Jaundice	10	8.1
Seizures	7	5.6
OTHERS (Meconiumaspiration, Hypoglycemia,Apnea)	20	16.2

62 had respiratory distress, 24 complained for dull activity, 7 seizure complaints.

Table 9: Clinical sepsis at/after admission distribution

Clinical Sepsis at Admission	Frequency	Percent
Yes	94	76.4
No	29	23.6
Total	123	100
Clinical Sepsis after Admission	Frequency	Percent
YES	105	85.4
NO	18	14.6
Total	123	100

94 patients had clinical sepsis at admission and 105 had after admission from out of total 123 patients.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 10: Initial sepsis screen result distribution

Initial Sepsis Screen	Frequency	Percent
Positive	79	64.2
Negative	44	35.8
Total	123	100

79 showed positive result for initial sepsis screen and 44 showed negative results

Table 11: Type of sepsis (eos/los) distribution

Type of sepsis	Frequency	Percent
Early Onset Sepsis	90	73.2
Late Onset Sepsis	33	26.8
Total	123	100

73.2% neonates had early onset of sepsis and 26.8 % had late onset of sepsis.

Table 12: Blood culture isolated organism distribution

Blood Culture Isolate	EOS	LOS	Total
Klebsiella	41(45.60%)	14(42.40%)	55(44.70%)
Citrobacter	18(20%)	6(18.20%)	24(19.50%)
Staphylococcus	9(10.0%)	3(9.10%)	12(9.70%)
Pseudomonas	8(8.90%)	3(9.10%)	11(8.90%)
Acinetobacter	5(5.60%)	3(9.10%)	8(6.50%)
Candida	4(4.40%)	1(1.10%)	5(4.10%)
Salmonella	1(1.10%)	0(0%)	1(0.80%)
E. COLI	4(4.40%)	3(9.10%)	7(5.70%)

Klebsiella (44.7%), Citrobacter (19.5%), pseudomonas 11(8.9), Staphylococcus (9.7%) were successfully isolated

Table 13: Sensitivity report distribution

Antibiotics	Sensitive to	PERCENT
Ampicillin	41	33.3%
Piperacillin/Tazobactam	42	34.1%
Ceftriaxone	41	33.3%
Amikacin	2	1.6%
Meropenem	86	69.9%
Ceftazidime	73	59.3%
Linezolid	7	5.6%
Cefepime	82	66.6%
Ciprofloxacin	51	41.4%
Gentamicin	46	37.3%
Vancomycin	1	0.8%
Teicoplanin	4	3.2%
Azithromycin	1	0.8%
Fluconazole	5	4%

Meropenem showed highest sensitivity 69.9%, cefepime with 66.6% sensitivity, lowest was of vancomycin and azithromycin with 0.8% sensitivity.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 14: Resistance report distribution

Antibiotics	Resistant to	Percent
Ampicillin	41	33.3
Piperacillin/Tazobactam	42	34.1
Ceftriaxone	41	33.3
Amikacin	2	1.6
Meropenem	86	69.9
Ceftazidime	73	59.3
Linezolid	7	5.6
Cefepime	82	66.6
Ciprofloxacin	51	41.4
Gentamicin	46	37.3
Vancomycin	1	0.8
Teicoplanin	4	3.2
Azithromycin	1	0.8
Fluconazole	5	4

Cefepime was resistant to 82 with 66.6% patients. Highest was with meropenem 69.9%. lowest was vancomycin and azithromycin, 0.8%

Table 15: CSF analysis report distribution

CSF Analysis	Frequency	Percent
Done – Abnormal	6	4.9
Done – Normal	80	65
Not Done	37	30.1
Total	123	100

CSF analysis done abnormal was 4.9% and normally done was 65%, not done at all was 30.1%

Table 16: Day of admission when antibiotic started distribution

Antibiotic Started	Frequency	of Admission when antibiotic started Percent Third Day 1% Fourth Day 13%
First Day	99	80.5
Second Day	7	5.7 First
Third Day	2	Fourth Day1.6
Fourth Day	16	13
Total	123	100

Antibiotics first day started had by 80.5% of patients and till fourth day was 13%

Table 17: Unit policy of first line antibiotic combination distribution

First Line Antibiotic	Frequency	Percent
Ampicillin, Amikacin	100	81.3
Piperacillin/Tazobactam,Amikacin	14	11.4
Cefotaxime, Amikacin	4	3.3
Meropenem, Vancomycin,Metronidazole	1	0.8
Ampicillin/Cloxacillin,Cefotaxime, Metronidazole	1	0.8
Ampicillin/Cloxacillin,Amikacin	1	0.8
Meropenem	1	0.8
Gentamicin	1	0.8
Total	123	100

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

First line antibiotic combination, ampicillin, amikacin was taken by 100% patients, piperacillin/tazobactam, amikacin by 11.4% patients.

Table 18: Shift to second line antibiotics distribution

Second Line needed	Frequency	Percent
Yes	35	28.5
No	88	71.5
Total	123	100

Table 19: Reason for second line antibiotic distribution

Reason for shifting to second line	Frequency	PERCENT
In View of Abnormal CSF analysis	3	8.5%
In view of no clinical response	16	45.7%
In view of sensitivity report	17	48.5%

Table 20: Complications and interventions distribution

Complication	Yes	%	No	%
Hypoglycemia	16	13	107	87
GIR	6	37.5		
Apnea	8	6.5	115	93.5
CAFFEINE	6	75		
Seizures	11	8.9	112	91.1
LEVETIRACETAM	1	9.1		
PHENOBARBITONE	10	90.9		
PHENYTOIN	2	18.2		
DIC	6	4.9	117	95.1
INTROPE SUPPORT	30	24.4	93	75.6
DOPAMINE	30	100		
DOBUTAMINE	2	6.7		
ADRENALINE	3	10		
CPAP	32	26	91	74
> 3 DAY	14	43.8		
< 3 DAYS	18	56.3		
Ventilator	33	26.8	90	73.2
> 3 DAY	9	27.3		
< 3 DAYS	24	72.7		
Transfusion	10	8.1	113	91.9
FFP	6	60		
PRBC	5	50		

Table 21: Weight change at outcome distribution

Weight at outcome	Frequency	Percent
SAME WEIGHT	48	39
INCREASE IN WEIGHT	18	14.6
DECREASE IN WEIGHT	57	46.4

Same weight seen in 48 patients and decrease in weight by 57

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 22: Outcome distribution

Outcome	Frequency	Percent
Discharged	80	65
Died	25	20.3
LAMA	13	10.6
Absconded	3	2.4
Referred	2	1.6
Total	123	100

Table 23: Distribution of stay duration

Duration of Stay	Frequency	Percent
< 7 Days	15	12.2
7 - 14 Days	46	37.4
> 14 Days	62	50.4
Total	123	100

< 7 Days, Duration of Stay by 12.2% and > 14 Days stay period by 50.4% patients

DISCUSSION

Despite in-vitro culture data indicating resistance, the majority of patients showed clinical improvement when ampicillin and amikacin were combined. Despite the fact that the initial sepsis test was positive in 64.2% of the instances, 76.4% of the patients upon admission and 85.4% of the patients after admission displayed clinical symptoms and/or sepsis indications. The most likely explanation for this discrepancy is that the majority of these individuals are presented to the institute after receiving one or more doses of intravenous antibiotics. Because of this, the sepsis screen may not prove to be a sensitive tool for choosing when to begin antimicrobial therapy in the neonatal intensive care units (NICUs) of tertiary care hospitals, where cases are typically received from various nearby SNCUs. The effectiveness of this test therefore needs to be further investigated by multicentric studies across the state.[9-11]

In the survey, the month of September 2021 (17.9) showed the highest percentage of newborns, while the month of November 2021 showed 15.4 participants. At government hospitals, 75.6% of babies were born, whereas at private hospitals, 24.4% of babies were born. The percentage of babies born at a normal weight was 50.4%, whereas the percentage of babies born with macrosomia was 0.8%. 65.1% of the instances were acquired after birth, whereas 34.9% occurred during pregnancy. The lowest incidence, 0.8%, was observed in 32-33 weeks, whereas the highest incidence, 23%, occurred in 37-38 weeks. Oligohydramnios was the most common risk factor, accounting for 64.2% of cases, followed by PROM at 10.5%, whereas 79 cases demonstrated the absence of any risk factors. The lowest levels of sensitivity were shown by vancomycin and azithromycin, both of which had 0.8%. The highest level of sensitivity was shown by meropenem, which had 69.9%. Cefepime had 66.6%.[10-12]

In the current experiment, bacteria like Klebsiella (44.7%), Citrobacter (19.5%), and Staphylococcus (9.7%) were successfully isolated. Researchers Poonam Marwah and colleagues were successful in isolating staphylococcus (47.3%), klebsiella (14.9%), and acinetobacter (14.9%) in their investigation. Klebsiella (34.9%), Staphylococcus (32.5%), and E. coli (9.30%) were successfully isolated, according to minakshi bhat et al's study. The bacteria found in the experiment by vrishali avinash muley et al. were klebsiella (35.4%), staphylococcus (22.9%), and e. Coli (16.7%).[11-13]

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

In earlier studies, Perinatal events affect newborn outcomes. This helped develop a perinatal score for predicting neonatal sepsis. Clinically, perinatal variables combine and are interdependent. In the study, 85/94 newborns had several sepsis-causing factors. Incidence of newborn sepsis in relation to a risk factor in the context of other high risk variables may not reflect that factor's true significance. No previous study considered this. FSL, MP, UVE, and BA are independent perinatal factors based on their interrelationship. FSL and MP have previously been linked to chosio-amnionitis. In our country, many midwives are uneducated. This leads to low sepsis standards during field vaginal exams.[12-14]

This component alone was associated with 24% of sepsis. Birth hypoxia can weaken the newborn's resistance to infection and expose them to active resuscitation. Our findings linked this factor to 32% infection. Given the independence of the foregoing elements, a score of 2 is justified. Prolonged membrane rupture is a major cause of newborn sepsis. The reported incidence of neonatal sepsis with this factor ranges from 3 to 13.2. We showed that whereas neonates with PROM (28%) had a higher incidence of sepsis than controls, the incidence was much lower when independent variables were not related with PROM.[14-16] When present alone or under controlled conditions (i.e. cases with artificial membrane rupture (in the control group), no infection was found. Prolonged labour alone showed a low incidence of sepsis. This component was given a falsely high score since other prenatal factors weren't considered. We gave protracted labour and PROM a 1 due to their interdependence. All normal birth weight newborns with sepsis got a score of 4 or greater on the above-mentioned 10-point scale. Even 1 was linked to sepsis in LBW newborns. LBW and sepsis are linked due to preterm and small-for-date newborns' immature immune systems.

CONCLUSION

The investigation highlights the significance of earlier antibiotic administration and clinical suspicions of sepsis in newborns for improved results. The majority of neonatal sepsis confirmed cases under the institution are suitably covered by the current NICU unit antimicrobial policy. In situations where the cultures were positive, problems like hypoglycemia, apnea, convulsions, DIC, and respiratory distress are more common and must be actively controlled.

References

1. Bang AT, Bang RA, Bactule SB, Reddy HM, Deshmukh MD. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999; 354:1955-61
2. Stoll BJ. The global impact of neonatal infection. Clin Perinatol 1997; 24:1-21
3. Report of the National Neonatal Perinatal Database (National Neonatology Forum) 2002-03.
4. Singh M, Narang A, Bhakoo ON. Predictive perinatal score in the diagnosis of neonatal sepsis. J Trop Pediatr. 1994. Dec;40(6):365-8
5. Takkar VP, Bhakoo ON, Narang A. Scoring system for the prediction of early neonatal infections. Indian Pediatr. 1974;11:597-600
6. Baltimore RS. Neonatal nosocomial infections. Semin Perinatol 1998;22:25-32
7. Wolach B. Neonatal sepsis: pathogenesis and supportive therapy. Semin Perinatol1997;21:28-38
8. Gerdes JS, Polin R. Early diagnosis and treatment of neonatal sepsis. Indian J Pediatr 1998;65:63-78.
9. Polinski C. The value of white blood cell count and differential in the prediction of neonatal sepsis. Neonatal Netw. 1996;15:13-23

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

10. Da Silva O, Ohlsson A, Kenyon C. Accuracy of leukocyte indices and C-reactive protein for diagnosis of neonatal sepsis: a critical review. Pediatr Infect Dis J 1995;14:362-6
11. Manroe BL, Weinberg AG, Rosenfeld CR, Browne R. The neonatal blood count in health and disease. I.Refernce values for neutrophilic cells. J Pediatr 1979;95:89-98
12. Mouzinho A, Rosenfeld CR, Sanchez PJ, Risser R. Revised reference ranges for circulating neutrophils in verylow-birth-weight neonates. Pediatrics 1994;94:76-82.
13. Sarff LD, Platt LH, McCracken GH Jr. Cerebrospinal fluid evaluation in neonates: Comparison of high-risk neonates with and without meningitis. J Pediatr 1976;88:473-7
14. Upadhyay, A., Aggarwal, R., Paul, V. K., Kapil, A., & Deorari, A. K. (2003, April). Profile of neonatal sepsis in a tertiary care neonatal unit from India: A retrospective study. In Pediatric Research (Vol. 53, No. 4, pp. 310A-310A). 351 WEST CAMDEN ST, BALTIMORE, MD 21201-2436 USA: INT PEDIATRIC RESEARCH FOUNDATION, INC..
15. Deorari Ashok K. For the Investigators of the National Neonatal Perinatal Database (NNPD). Changing pattern of bacteriologic profile in Neonatal Sepsis among intramural babies. Journal of Neonatology 2006;20:8-15.
16. Zaidi AK, Huskins WC, Thaver D, Bhutta ZA, Abbas Z, Goldmann DA. Hospital-acquired neonatal infections in developing countries. Lancet 2005;365:1175-88.