Section: General Medicine

Original Research Article

RISK FACTORS AND IMMEDIATE OUTCOME OF EARLY ONSET SEPSIS IN NEONATES IN A TACHING MEDICAL COLLEGE IN IMPHAL: A PROSPECTIVE OBSERVATIONAL STUDY

Ahanthem Vivek Singh[1], Pebam Arunkumar Singh[2], N. Kameshore Singh[3], Y. Rameshwor Singh[4]

[1]Associate Professor, Department of General Medicine PSP Medical College hospital and research institute, Tambaram, Panruti, Tamil Nadu, India.
[2]Associate Professor, Department of General Medicine, Indira Medical College, Thiravallur, Tamil Nadu, India.
[3]Associate Professor, Department of General Medicine Swamy Vivekanand Medical College, Unjanai, Tamil Nadu, India.

Received : 10/04/2026
Received in revised form : 29/05/2026
Accepted : 13/06/2026

Keywords:
Early onset sepsis, Neonatal sepsis, Outcome, Risk factors.

Corresponding Author:
Dr. N. Kameshore Singh,
Email: nandkame@gmail.com

DOI: 10.47009/jamp.2026.8.4.284

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (4); 1675-1682

ABSTRACT

Background: In resource-limited settings, early onset neonatal sepsis (EOS) can be diagnosed early based on the predictive risk factor model and managed accordingly; thus, helping reduce overall neonatal morbidity and mortality. Early indicators such as respiratory distress, temperature instability, and poor feeding necessitate a high index of suspicion for sepsis, prompting clinicians to initiate empirical antibiotic therapy while awaiting definitive laboratory results. These factors warrant the need for identifying the risk factors and etiologies of EOS prevailing in the geographical area in order to optimize neonatal care. **Objectives:** To determine the maternal and neonatal risk factors associated with early onset sepsis in neonates admitted in JNIMS, Imphal, to evaluate the immediate outcome and to determine the various factors associated with increased risk of mortality among them. **Materials and methods:** A prospective observational study was done in the Department of Paediatrics, JNIMS, Imphal, Manipur during the period from September 2022 till August 2023. All neonates admitted in the SNCU and NICU with history, clinical manifestations and laboratory parameter suggestive of EOS, within 72 hours of life during the study period were the study participants. A detailed history and clinical examination were recorded following which necessary laboratory investigations were performed - which included neonatal sepsis screen and blood culture and sensitivity. When indicated, lumbar puncture was performed after which cerebrospinal fluid analysis and culture and sensitivity was performed. After initial assessment and blood sampling, all neonates included in the study were given empirical parenteral antibiotics as per standard recommended protocol, and the choice of antibiotic was adjusted later according to culture and sensitivity report as well as clinical response to therapy. All the cases were closely monitored and their clinical progress was recorded daily. Neonates included in this study were followed up during their stay in the hospital till discharge or till mortality, and immediate outcome was evaluated. **Results:** A total of 150 neonates were included in the study. A total of 23 out of the 150 neonates expired during the study, resulting in a case fatality rate of 15.3%. Maternal risk factors which showed statistically significant association with EOS in the study were – maternal febrile illness within 2 weeks of delivery (p = 0.028) and premature rupture of membranes more than 18 hours (p = 0.025). Neonatal risk factors which showed statistically significant association with EOS in the study were – low birth weight (p = 0.003) and prematurity (p = 0.002). Among the presenting clinical features of the neonates, abnormal body temperature (p = 0.036) and abdominal distension (p = 0.026) were determined to have significant association with EOS. Maternal risk factors which showed statistically significant association with mortality in EOS were – maternal febrile illness within 2 weeks of delivery (p = 0.001), premature rupture of membranes more than 18 hours (p = 0.001) and meconium-stained amniotic fluid (p = 0.025). Among the neonatal risk factors, factors which showed

statistically significant association with mortality in EOS were – low birth weight (p = 0.001) and prematurity (p = 0.001). Among the presenting clinical features of the neonates, respiratory distress (p = 0.001), convulsions (p = 0.001), blood culture positivity (p = 0.016) and poor feeding (p = 0.019) had significant association with mortality in EOS. Various factors determined to have statistically significant association with prolonged hospital stay of more than 7 days were – low birth weight (p = 0.001), respiratory distress (p = 0.001), lethargy (p = 0.002) and premature rupture of membrane (p = 0.007). **Conclusion:** Maternal febrile illness, premature rupture of membranes more than 18 hours, low birth weight and prematurity were significantly associated with early onset sepsis (EOS) in neonates. *Klebsiella pneumoniae* was the predominant organism isolated. Over half of culture-positive cases resulted in mortality. Factors like maternal febrile illness, premature rupture of membranes, low birth weight, prematurity, respiratory distress, convulsions and blood culture positivity strongly correlate with mortality, highlighting the need for targeted preventive strategies and improved neonatal care protocols to mitigate the impact of EOS.

INTRODUCTION

Neonatal sepsis is a clinical syndrome of systemic illness accompanied by bacteraemia occurring in the first month of life.[1] According to the World Health Organization (WHO) estimates, neonatal sepsis is responsible for 30% to 50% of total neonatal deaths each year in developing countries.[2,3] Globally, of the three million annual neonatal sepsis cases (2202/1,00,000 live births), India has the highest incidence of clinical sepsis (17,000/1,00,000 live births).[4] The case fatality rate of sepsis among neonates ranges between 25 to 65% in India.[5]

Neonatal sepsis can be classified into two categories depending on the time of onset of symptoms. Early onset sepsis (EOS) presents within the first 72 hours of life, while late onset sepsis presents after 72 hours of life.[6-9] Despite advances in perinatal care and antibiotic therapy, EOS remains a major cause for neonatal mortality and morbidity. The case fatality in EOS ranges from 16.7% to 19.4%.[10-12]

Epidemiologically, EOS incidence varies globally and is influenced by maternal colonization rates with pathogens such as group B Streptococcus (GBS), Escherichia coli and others. In developed countries, screening protocols and intrapartum antibiotic prophylaxis (IAP) have reduced GBS-related sepsis rates, while challenges persist in resource-limited settings where access to prenatal care and antibiotics is limited.[13] Understanding this disparity is crucial for implementing effective preventive measures and treatment protocols tailored to different healthcare contexts. Furthermore, the varying microbiological profile of EOS varies from setting to setting. Investigations such as total and differential leukocyte count, absolute neutrophil count, immature to total neutrophil ratio and biomarkers like C-reactive protein (CRP) and procalcitonin (PCT), aid in decision-making for antibiotic initiation and duration. However, the utility of these biomarkers in differentiating bacterial sepsis from non-infectious causes remains debated, highlighting the ongoing need for proper diagnostic algorithms tailored to neonatal populations.[14,15]

Blood culture still remains the gold standard test for confirmation of neonatal sepsis.[16,17] However, a blood culture report takes at least 48 hours and has been found to be positive in 25–45% of cases with low yield results after antenatal antibiotic exposure.[18,19] In India, culture testing facilities are absent in most of the district hospitals.[18] In this situation, the prediction and diagnosis of neonatal sepsis rely on culture-independent diagnostics and a risk factor scoring system.17 The use of risk factor-based approach to guide treatment decisions has been debated in view of cost-effectiveness.[26,27]

Hence, in resource-limited settings, EOS can be diagnosed early based on the predictive risk factor model and managed accordingly; thus, helping reduce overall neonatal morbidity and mortality.[20,21] Early indicators such as respiratory distress, temperature instability, and poor feeding necessitate a high index of suspicion for sepsis, prompting clinicians to initiate empirical antibiotic therapy while awaiting definitive laboratory results.[13]

These factors warrant the need for identifying the risk factors and etiologies of EOS prevailing in the geographical area in order to optimize neonatal care. With the above background, this study was conducted to determine the prevalent risk factors and immediate outcome of early onset sepsis in neonates admitted in the Sick Newborn Care Unit (SNCU) and Neonatal Intensive Care Unit (NICU) of a tertiary health-care centre in North-East India. By studying both the risk factors and outcomes, we aim to assess which certain risk factors are associated with poor outcome and higher neonatal mortality.

Aims and Objectives

The main aim of the present study was to find the risk factors associated with early onset sepsis in neonates admitted in Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal and assess the effect of various risk factors on the immediate outcome of early onset sepsis in neonates admitted in JNIMS, Imphal. Consequently, the study objectives were made as to determine the maternal and neonatal risk factors associated with early onset sepsis in neonates admitted in JNIMS, Imphal, to evaluate the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

immediate outcome and to determine the various factors associated with increased risk of mortality among them.

MATERIALS AND METHODS

A hospital-based, prospective observational study was done in the Department of Paediatrics, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal, Manipur during the period from September 2022 till August 2023. All neonates admitted in the Sick Newborn Care Unit (SNCU) and Neonatal Intensive Care Unit (NICU), JNIMS, Imphal, Manipur with history, clinical manifestations and laboratory parameter suggestive of EOS, within 72 hours of life during the study period were the study participants. Neonates with suspected inborn errors of metabolism, multiple congenital anomalies, or suspected genetic syndrome, neonates who were discharged against medical advice and birth weight less than 600 grams were excluded.

Assuming an incidence of early onset sepsis as 9.75% as per a study conducted by the investigators of the Delhi Neonatal Infection Study (DeNIS) collaboration in 2016 in India,[22] and by taking 5% absolute allowable error at 95% confidence interval, the minimal sample size was estimated to be 135. Considering a 10% non-participation rate, the final sample size was calculated to be 150. The neonates were consecutively selected by purposive sampling method during the study period till the required sample size was reached.

After obtaining informed consent from their parents or legal guardians, a detailed history and clinical examination were recorded using a pre-designed structured proforma, following which necessary laboratory investigations were performed - which included neonatal sepsis screen and blood culture and sensitivity. These were investigations sent routinely and had established patient safety. When indicated, lumbar puncture was performed after which cerebrospinal fluid analysis and culture and sensitivity was performed. Under strict aseptic precautions, blood samples were collected in sterile blood culture bottle, EDTA and plain vials. These samples were sent to Microbiology and Pathology for sepsis screen (complete haemogram including haemoglobin, total leucocyte count, absolute neutrophil count, immature to total neutrophil count, micro-erythrocyte sedimentation rate, C-reactive protein and blood culture). For blood culture, 2 ml blood was drawn from the peripheral vein in a paediatric blood culture broth vial. Blood culture was considered positive when a colony growth was detected within 48 hours of incubation.

After initial assessment and blood sampling, all neonates included in the study were given empirical parenteral antibiotics as per standard recommended protocol, and the choice of antibiotic was adjusted later according to culture and sensitivity report as well as clinical response to therapy. All the cases were closely monitored and their clinical progress was recorded daily. Neonates included in this study were followed up during their stay in the hospital till discharge or till mortality, and immediate outcome was evaluated.

The dependent variables were maternal risk factors, risk factors related to delivery and neonatal risk factors whereas the treatment outcome and need of specialized treatment were the outcome variables. The data was entered in Microsoft Excel and then analysed using IBM SPSS Statistics for Windows.v27.0) software. Categorical data was described as percentage and proportion. Numerical data was described as either mean and standard deviation, or median and interquartile range as suitable. Association between categorical variables was analysed using the Chi-square test. A p value of < 0.05 was considered statistically significant. Ethical approval from the Institutional Ethics Committee, JNIMS, Imphal was obtained prior to the study (No. Ac/03/IEC/JNIMS/2018-PGT, No.8/21/327/PGT-2021).

RESULTS

A total of 4,580 live births occurred in Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal from September 2022 to August 2023. A total of 536 (11.7%) neonates required NICU admission within 72 hours of life. 164 (30.6%) neonates were suspected of early onset sepsis (EOS). After excluding 9 neonates (2 with suspected inborn error of metabolism, 3 with multiple congenital anomalies and 9 who were discharged against medical advice), a total of 150 neonates were enrolled in the study. [Figure 1]

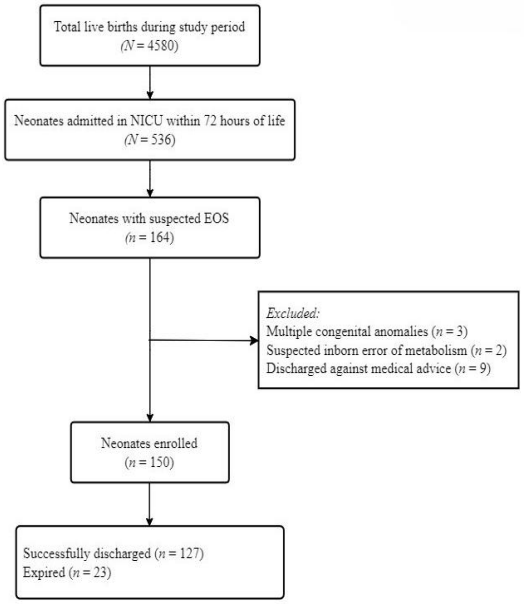

Figure 1: Flow of participants in the study

(EOS – early onset sepsis; NICU – neonatal intensive care unit)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Majority (8; 53.3%) were males, and male to female ratio was 1.14: 1. The median (IQR) gestational age was 37 weeks (34; 38 weeks) and 63 (42%) neonates were preterm. The mean (SD) birth weight was 2562 ± 903 grams and 60 (40%) cases had low birth weight. The median (IQR) age at the time of admission was 12 hours (2; 24 hours) of life. Majority of the neonates (94; 62.7%) were in-born. Hinduism was the predominant religion (94; 62.7%) Only 36 (24%) mothers were 20 years of age or younger.

Regarding maternal risk factors, a majority of the mothers were multiparous (101; 67.3%). One-third of them (36; 24%) cases belonged to low socioeconomic class. Prominent maternal risk factors were – premature rupture of membranes (38; 25.3%) and more than 3 per vaginal examinations during labour (37; 24.7%). Maternal febrile illness was seen in 26 (17.3%) cases. Only 6 (4%) cases reported foul-smelling liquor. [Table 1]

Table 1: Distribution of maternal risk factors (n=150)

Parameters	Frequency (%)
Maternal age	
• ≤ 20 years	36 (24)
• > 20 years	114 (76)
Parity	
• Primiparous	49 (32.7)
• Multiparous	101 (67.3)
Socio-economic status	
• Low	36 (24)
• Middle or high	114 (76)
History of maternal febrile illness	
• Yes	26 (17.3)
• No	124 (82.7)
History of antepartum haemorrhage	
• Yes	8 (5.3)
• No	142 (94.7)
History of PROM > 18 hours	
• Yes	38 (25.3)
• No	112 (74.7)
Number of PV examinations	
• ≤ 3	37 (24.7)
• > 3	113 (75.3)
Meconium-stained amniotic fluid	
• Yes	10 (6.7)
• No	140 (93.3)
Foul smelling liquor	
• Yes	6 (4)
• No	144 (96)

Majority (124; 83.3%) of the neonates were delivered by vaginal delivery. Only 9 (6%) cases reported prolonged labour. Birth asphyxia was present in 13 (8.7%) cases of early onset sepsis. Difficult resuscitation as reported by APGAR score ≤ 5 at 5 minutes was seen in 12 (8%) cases. [Table 2]

Table 2: Risk factors related to delivery of the neonates

Parameters	Frequency (%)
Mode of delivery	
• Vaginal delivery	125 (83.3)
• Assisted vaginal delivery	6 (4)
• Lower segment Caesarean section	19 (12.7)
Duration of labour	
• > 20 hours	9 (6)
• Up-to 20 hours	141 (94)
Birth asphyxia	
• Yes	13 (8.7)
• No	137 (91.3)
APGAR Score at 5 minutes	
• ≤ 5	12 (8)
• > 5	138 (92)

The most common presenting complaint was poor feeding (77; 51.3%), followed by respiratory distress (69; 46%). The other clinical features reported were – abnormal body temperature (54; 36%), jaundice (49; 32.7%), lethargy (41; 27.3%), abdominal distension (16; 10.7%), convulsions (15; 10%) and pustular rash (10; 6.7%).

Blood culture was sent for all 150 cases. Growth on blood culture was reported in only 7 (5%) cases, of which 4 (57%) expired. Klebsiella pneumoniae (4; 57%) was the most frequent organism isolated and was associated with a case fatality rate of 50%. The other organisms isolated were Escherichia coli (2; 29%) and Pseudomonas aeruginosa (1; 14%).

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The median (IQR) duration of hospital stay was 7 days (5; 10 days). A total of 23 out of the 150 neonates expired during the study, resulting in a case fatality rate of 15.3%. Regarding outcome of the neonates of the study, 127 (84.7%) were successfully discharged, 45 (30%) neonates needed prolonged antibiotic therapy more than 7 days and 54 (36%) neonates required positive pressure ventilation. Septic shock occurred in 21 (14%) neonates while only 6 (%) cases had meningitis.

Maternal risk factors which showed statistically significant association with EOS in the study were – maternal febrile illness within 2 weeks of delivery (p = 0.028) and premature rupture of membranes more than 18 hours (p = 0.025). [Table 3]

Table 3: Association between maternal risk factors and EOS

Parameter	Observation	Sepsis screen		Total	*p* value
		+	-		
Maternal age	+	28	8	36	0.072
≤ 20 years	-	102	12	114	
Multiparity	+	87	14	101	0.785
	-	43	6	49	
Low SES	+	32	4	36	0.653
	-	98	16	114	
Maternal febrile illness	+	26	0	26	0.028
	-	104	20	124	
Antepartum haemorrhage	+	7	1	8	0.943
	-	123	19	142	
Premature rupture of membrane	+	37	1	38	0.025
	-	93	19	112	
Per vaginal examinations > 3	+	33	4	37	0.603
	-	97	16	113	
Meconium-stained amniotic fluid	+	10	0	10	0.199
	-	120	20	140	
Foul-smelling liquor	+	6	0	6	0.327
	-	124	20	144	
Prolonged labour	+	9	0	9	0.225
	-	121	20	141	

Neonatal risk factors which showed statistically significant association with EOS in the study were – low birth weight (p = 0.003) and prematurity (p = 0.002) (Table 4). Among the presenting clinical features of the neonates, abnormal body temperature (p = 0.036) and abdominal distension (p = 0.026) were determined to have significant association with EOS.

Table 4: Association between neonatal risk factors and EOS

Parameter	Observation	Sepsis screen		Total	*p* value
		+	-		
Sex	M	68	12	80	0.521
	F	62	8	70	
Low birth weight	+	58	2	60	0.003
	-	72	18	90	
Prematurity	+	61	2	63	0.002
	-	69	18	87	
Birth asphyxia	+	13	0	13	0.139
	-	117	20	137	
APGAR < 5 at 5 minutes	+	12	0	12	0.157
	-	118	20	138	

Maternal risk factors which showed statistically significant association with mortality in EOS were – maternal febrile illness within 2 weeks of delivery (p = 0.001), premature rupture of membranes more than 18 hours (p = 0.001) and meconium-stained amniotic fluid (p = 0.025). Among the neonatal risk factors, factors which showed statistically significant association with mortality in EOS were – low birth weight (p = 0.001) and prematurity (p = 0.001). Among the presenting clinical features of the neonates, respiratory distress (p = 0.001), convulsions (p = 0.001), blood culture positivity (p = 0.016) and poor feeding (p = 0.019) had significant association with mortality in EOS. [Table 5]

Table 5: Association between maternal & neonatal risk factors and mortality in EOS

Parameter	Observation	Alive	Expired	Total	*p* value
Maternal age	+	31	5	36	0.783
≤ 20 years	-	96	18	114	
Multiparity	+	87	14	101	0.814
	-	43	6	49	
Low SES	+	27	9	36	0.065

ISSN (O): 2687-5365; ISSN (P): 2753-6556

	-	100	14	114	
Maternal febrile illness	+	16	10	26	0.001
	-	111	13	124	
Antepartum haemorrhage	+	6	2	8	0.435
	-	121	21	142	
Premature rupture of membrane	+	26	12	38	0.001
	-	101	11	112	
Per vaginal examinations > 3	+	28	9	37	0.08
	-	99	14	113	
Meconium-stained amniotic fluid	+	6	4	10	0.025
	-	121	19	140	
Foul-smelling liquor	+	4	2	6	0.212
	-	123	21	144	
Prolonged labour	+	8	1	9	0.717
	-	119	22	141	
Sex of neonate	M	68	12	80	0.904
	F	59	11	70	
Low birth weight	+	42	18	60	0.001
	-	85	5	90	
Prematurity	+	44	19	63	0.001
	-	83	4	87	
Birth asphyxia	+	9	4	13	0.106
	-	118	19	137	
APGAR < 5 at 5 minutes	+	8	4	12	0.071
	-	119	19	138	
Blood culture	+	3	3	6	0.016
	-	124	20	144	

Various factors determined to have statistically significant association with prolonged hospital stay of more than 7 days were – low birth weight (p = 0.001), respiratory distress (p = 0.001), lethargy (p = 0.002) and premature rupture of membrane (p = 0.007).

DISCUSSION

This prospective observational study enrolling 150 neonates was undertaken to determine the specific risk factors associated with early onset sepsis (EOS) and their impact on immediate outcomes, particularly mortality.

In the study, a slight male predominance was reported, with male to female ratio of 1.14: 1. Similar findings were noted in regional studies.[23-26] In this study, 40% neonates were preterm – which was lower than findings in studies conducted by Jain et al. (2003), Dasoky et al. (2009) and Zakariya et al. (2012) with prematurity being present in 58.4%, 53.3% and 60.6% cases respectively.[27-29] Only 40% cases in this study had low birth weight, which is lower than findings in other comparable studies on neonatal sepsis.[27] Despite this, both prematurity and low birth weight emerged as independent risk factors associated with both early onset neonatal sepsis and mortality. This may be related to the fact that these neonates require prolonged hospitalization and interventions which predispose them to increased risk of hospital acquired infection or related to innate immunological deficiency.[30,23,30] These vulnerabilities highlight the challenges faced by preterm and low birth weight infants in combating infections early in life, necessitating heightened clinical vigilance and targeted interventions for high-risk neonates.

Among the other neonatal risk factors, abnormal temperature (fever or hypothermia) and abdominal distension were identified as significant risk factors for early onset sepsis. The most common clinical manifestations in neonates with EOS were poor feeding (51.3%) and respiratory distress (46%), which is consistent with the findings of Chaudhari et al. (2016).[31] Maternal factors that were determined to be independent risk factors associated with both EOS and mortality were – maternal febrile illness and premature rupture of membrane > 18 hours. This aligned with findings made by Bharat et al. (2017), Santhanam (2018), Rafi (2020), Guo et al. (2023).[23,323-34] In a similar study, Hasan et al. (2011) also reported the finding of maternal fever as an important independent factor in their studied subjects.[35] Maternal fever is indicative of maternal infections which may be transmitted to the fetus in-utero or during passage through birth canal resulting in early onset sepsis.[36] Premature rupture of membranes increases the risk of acquiring ascending infections from the maternal tract into the amniotic sac.72 Prolonged rupture of membranes and maternal febrile illness were associated with significant neonatal mortality in other studies as well.[37,38] These findings underscore the critical role of maternal health and intrauterine transmission of pathogens to neonates during the perinatal period.

Worldwide records show that the isolation rates on blood cultures vary from 6.7% to 55.4%.[39] However, in contrast, our study had low blood culture positivity rate of 4.7%. This may have been due to improper collection technique, unavailability of specific neonatal blood culture vials, use of antibiotics prior to sampling, or sepsis due to other organisms like fungi or viral pathogens.

Traditionally, the common pathogens implicated in early-onset sepsis include Escherichia coli, group B

ISSN (O): 2687-5365; ISSN (P): 2753-6556

streptococci, Listeria monocytogenes, and Enterococcus spp. In contrast, Klebsiella spp. was the predominant organism isolated in the study, aligning with the findings of Zakariya et al. (2011),[40] Kaur et al. (2015),[41] Jajoo et al. (2015),[42] Bandyopadhyay et al. (2018),[43] and Jatsho et al. (2020).[44] In the DeNIS study conducted in India in 2016, Acinetobacter spp, coagulase-negative staphylococci, and Klebsiella spp, usually recognised as nosocomial pathogens, were the dominant pathogens in neonates with early-onset sepsis.[22]

A total of 23 out of the 150 neonates expired during the study, resulting in a case fatality rate of 15.3%. This was comparable to findings reported by Jajoo et al (14%),[42] Bharat et al (2017),[23] reported a mortality rate of 11.7%, while Chacko et al. (2005),[11] reported 19.4%. The differences in mortality rates in neonatal sepsis may be attributed to sample sizes, socio-economic and racial factors, various microbial strains and choice of antibiotics. Regarding outcome of the neonates of the study, 45 (30%) neonates needed prolonged antibiotic therapy more than 7 days and 54 (36%) neonates required positive pressure ventilation. Septic shock occurred in 21 (14%) neonates while only 6 (%) cases had meningitis.

The findings from this study have important implications for clinical practice and public health interventions aimed at reducing the burden of neonatal sepsis in India. Strengthening maternal health programs to detect and manage febrile illnesses and prolonged rupture of membranes during pregnancy could potentially reduce the incidence of EOS. Additionally, enhancing neonatal care practices, including early recognition of clinical signs and symptoms, judicious use of diagnostic tests, and timely initiation of empiric antibiotic therapy, is crucial for improving outcomes for neonates at risk of sepsis.

The sample size and the inherent nature of being a single-centre study might limit the generalizability of the findings to broader populations or different healthcare settings. Improper collection technique, unavailability of specific neonatal blood culture vials and use of antibiotics prior to sampling may have limited the blood culture positivity.

CONCLUSION

Maternal febrile illness, premature rupture of membranes more than 18 hours, low birth weight and prematurity were significantly associated with early onset sepsis (EOS) in neonates. *Klebsiella pneumoniae* was the predominant organism isolated. Over half of culture-positive cases resulted in mortality. Factors like maternal febrile illness, premature rupture of membranes, low birth weight, prematurity, respiratory distress, convulsions and blood culture positivity strongly correlate with mortality, highlighting the need for targeted preventive strategies and improved neonatal care protocols to mitigate the impact of EOS.

Conflict of interest: None
Source of finding: None

REFERENCES

1. Gomella TL, Cunningham MD, Eyal FG, Turtle DJ. Neonatology: Management, procedures, on-call problems, diseases and drugs. 7th ed. New Delhi: McGraw Hill Education (India); 2013.
2. Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD. Effect of home-based neonatal care and management of sepsis on neonatal mortality: Field trial in rural India. Lancet. 1999;354(9194):1995-61.
3. Stoll BJ. The global impact of neonatal infection. Clin Perinatol. 1997;24(1):1-21.
4. Fleischmann-Struzek C, Goldfarb DM, Schlattmann P, Schapbach LJ, Reinhart K, Kisson N. The global burden of pediatric and neonatal sepsis: A systematic review. Lancet Respir Med. 2018;6(3):223-30.
5. Kartik R, Manjunath S, Doddabasappa P, Malavika J. Evaluation of screening of neonatal sepsis. Int J Contemp Pediatr. 2018;5(2):580-3.
6. Singh M, Narang A, Bhakoo ON. Predictive perinatal score in the diagnosis of neonatal sepsis. J Trop Pediatr. 1994 Dec;40(6):365-8.
7. Takkar VP, Bhakoo ON, Narang A. Scoring system for the prediction of early neonatal infections. Indian Pediatr. 1974;11(9):597-600.
8. Baltimore RS. Neonatal nosocomial infections. Semin Perinatol. 1998;22(1):25-32.
9. Wolach B. Neonatal sepsis: Pathogenesis and supportive therapy. Semin Perinatol. 1997;21(1):28-38.
10. Kuruvilla KA, Pillai S, Jesudason M, Jana AK. Bacterial profile of sepsis in neonatal unit in South India. Indian Pediatr. 1998;35(9):851-8.
11. Chacko B, Sohi I. Early onset neonatal sepsis. Indian J. Pediatr. 2005;72(1):23-6.
12. National Neonatology Forum. National neonatal-perinatal database (NNPD), Report 2002-03 [Internet]. 2005 Jan. Available from: https://www.newbornwhocc.org/pdf/nnpd_report_2002-03.pdf [cited 2023 Dec 18]
13. Mukhopadhyay S, Puopolo KM; Neonatal early-onset sepsis: Epidemiology and risk assessment. Neoreviews. 2015 Apr;16(4):e221–e230.
14. Escobar GJ. The neonatal "sepsis work-up": Personal reflections on the development of an evidence-based approach toward newborn infections in a managed care organization. Pediatrics. 1999 Jan;103(1 Suppl E):360-73.
15. Singh SA, Dutta S, Narang A. Predictive clinical scores for diagnosis of late onset neonatal septicaemia. J Trop Pediatr. 2003;49(4):235-9.
16. Datta S, Oberoi JK, Chugh TD. Laboratory diagnosis of neonatal sepsis. J Neonatol. 2006;20(1):16-23.
17. Gerdes JS. Diagnosis and management of bacterial infections in the neonate. Pediatr Clin North Am. 2004;51(4):939-59.
18. Kartik R, Manjunath S, Doddabasappa PN, Malavika JC. Evaluation of screening of neonatal sepsis. Int J Contemp Pediatr. 2018;5:580–3.
19. Tewari VV, Jain N. Monotherapy with amikacin or piperacillin-tazobactum empirically in neonates at risk for early-onset sepsis: A randomized controlled trial. J Trop Pediatr. 2014;60:297–302.
20. Hughes RG, Brocklehurst P, Steer PJ, Heath P, Stenson BM on behalf of the Royal College of Obstetricians and Gynaecologists. Prevention of early-onset neonatal group B streptococcal disease. Green-top Guideline No. 36. BJOG. 2017;124:e280–e305.
21. Bedford Russell AR, Kumar R. Early onset neonatal sepsis: Diagnostic dilemmas and practical management. Arch Dis Child Fetal Neonatal Ed. 2015 Jul;100(4):F350-4.
22. Investigators of the Delhi Neonatal Infection Study (DeNIS) collaboration. Characterisation and antimicrobial resistance of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

sepsis pathogens in neonates born in tertiary care centres in Delhi, India: a cohort study. Lancet Glob Health. 2016 Oct;4(10):e752-60.
23. Bharat RV, Singh CS, Singh LR. Risk Factors and Immediate Outcome of Early Onset Neonatal Sepsis. JMSCR. 2017 Apr;5(4):21050-6.
24. Swarnkar K, Swarnkar M. A study of early onset neonatal sepsis with special reference to sepsis screening parameters in a tertiary care centre of rural India. Int J Infect Dis. 2012;10(1):1-8.
25. Shrestha RK, Rai SK, Khanal LK, Manda PK. Bacteriological study of neonatal sepsis and antibiotic susceptibility pattern of isolates in Kathmandu, Nepal. Nepal Med Coll J. 2013 Mar 1;15(1):71-3.
26. Bangi VA, Devi SS. Neonatal sepsis: A risk approach. Journal of Dr. NTR University of Health Sciences. 2014 Oct 1;3(4):254-8.
27. Dasoky HA, Awaysheh FN, Kaplan NM, Rimawi HA, Agha RM, Abu-Setteh MH. Risk factors for neonatal sepsis in tertiary hospital in Jordan. JRMS. 2009 Dec;16(3):16-19.
28. Zakariya BP, Bhat VB, Harish BN, Arun T, Joseph NM. Risk factors and outcome of Klebsiella pneumoniae sepsis among newborns. Curr Pediatr Res. 2012;16(2):115-118.
29. Jain NK, Jain VM, Maheshwari S. Clinical profile of neonatal sepsis. Kathmandu Univ Med Jrnl. 2003; 1(2): 117-120
30. Castro EC, Leite ÁJ, Almeida MF, Guinsburg R. Perinatal factors associated with early neonatal deaths in very low birth weight preterm infants in Northeast Brazil. BMC Pediatr. 2014 Dec 20;14:312.
31. Chaudhari K, Shah B, Gosai D. Study of etiology, risk factors, clinical features and outcome in blood culture proven late onset septicemia. International Journal of Scientific Research. 2016;4(12):119-21.
32. Santhanam S, Arun S, Rebekah G, Ponmudi NJ, Chandran J, Jose R, et al. Perinatal Risk factors for neonatal early-onset group B streptococcal sepsis after initiation of risk-based maternal intrapartum antibiotic prophylaxis – A case control study. J Trop Pediatr. 2018 Aug 1;64(4):312-316.
33. Rafi MA, Miah MMZ, Wadood MA, Hossain MG. Risk factors and etiology of neonatal sepsis after hospital delivery: A case-control study in a tertiary care hospital of Rajshahi, Bangladesh. PLoS One. 2020 Nov 13;15(11):e0242275.
34. Guo L, Han W, Su Y, Wang N, Chen X, Ma J, et al. Perinatal risk factors for neonatal early-onset sepsis: a meta-analysis of observational studies. J Matern Fetal Neonatal Med. 2023 Dec;36(2):2259049.
35. Hasan MS, Mahmood CB. Predictive Values of Risk Factors in Neonatal Sepsis. J Bangladesh Coll Phys Surg. 2011; 29: 187-195.
36. Soman M, Green B, Daling J. Risk factors for early onset neonatal sepsis. Am.J. Epidemiol 1985; 121 (5): 712–719.
37. Koutouby A, Habibullah J. Neonatal sepsis in Dubai, United Arab Emirates. J Tropical Pediatrics. 1995;41:177-180.
38. Sheikh AM, Javed T, Afzal MF, Sheikh CA. Course and complications of early onset neonatal sepsis: A descriptive study. Annals. 2010 Oct-Dec; 16(4): 307-310.
39. Network NN. National Neonatal-Perinatal Database-Report 2002–2003. New Delhi, India: Department of Pediatrics, All India Institute of Medical Sciences. 2005.(73)
40. Zakariya BP, Bhat V, Harish BN, Arun Babu T, Joseph NM. Neonatal sepsis in a tertiary care hospital in South India: bacteriological profile and antibiotic sensitivity pattern. Indian J Pediatr. 2011 Apr;78(4):413-7.
41. Kaur K, Singh K, Singh K, Devi P. Bacteriological profile of neonatal sepsis and pattern of antimicrobial susceptibility in a tertiary care hospital of Amritsar. Global Journal For Research Analysis. 2015;4(7):466-8.(74).
42. Jajoo M, Kapoor K, Garg LK, Manchanda V, Mittal SK. To study the incidence and risk factors of early onset neonatal sepsis in an out born neonatal intensive care unit of India. J Clin Neonatol. 2015;4:91-5.

ISSN (O): 2687-5365; ISSN (P): 2753-6556