

Original Article



Sepsis Profile of Neonates Admitted to Neonatal Intensive Care Unit of a Tertiary Care Hospital

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Abstract

Background: Neonatal sepsis is defined as a clinical condition of bacteremia with clinical features of infection in the first 28 days of life. Neonatal sepsis is an important cause of neonatal deaths worldwide. If detected early and treated aggressively and appropriately with antibiotics with good supportive care, it can be possible to save a life. **Objective:** The present study is carried out to overview the clinical and investigations profile, and outcome of neonatal sepsis admitted in a neonatal intensive care unit (NICU). **Materials and Methods:** This is a retrospective descriptive study. This study included newborns diagnosed with neonatal sepsis admitted to the Neonatal Intensive Care Unit (NICU) of Khwaja Yunus Ali Medical College and Hospital, Sirajgonj from October 2020 to January 2022. The case records of 50 neonatal sepsis. The case records of these newborns were thoroughly studied and recorded for relevant information including detailed history including maternal, clinical evaluation, and available investigation. The outcome was also noted. **Results:** Among the 50 neonatal sepsis cases early-onset neonatal sepsis was 56%; where mostly preterm (74%) and low birth weight (44%). Clinical presentations were mostly reluctant to feed (70%) associated with other septic features. Septicemia only (36%), pneumonia (14%), neonatal intestinal obstruction (10%) were found as the main pattern of sepsis. Among the cases septic screening profile thrombocytopenia 84%, CRP Positive 78%, leukopenia 58%, anemia 26%, leukocytosis 22%, normal 20%, toxic granules or band form neutrophil 14%, positive blood culture 14% were found. Probable risk factors were found mainly low birth weight (78%) and prematurity (74%); overlapping with many other risk factors. Thirty-six percent were death among sepsis. **Conclusion:** In the neonatal intensive care unit mostly early-onset neonatal sepsis has been observed in outborn, premature, and Low Birth Weight (LBW) babies presenting with reluctance to feed with associated risk factors; where thrombocytopenia invariably found in sepsis screening and survival rate around sixty-five percent

Key words: Sepsis profile, Neonate, NICU

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Introduction

Neonatal sepsis is an important cause of neonatal deaths worldwide. If detected early and treated aggressively and appropriately with antibiotics with good supportive care, it can be possible to save neonatal life.¹ Surviving an infant can have significant neurological sequelae as a consequence of CNS involvement, septic shock, or hypoxemia.²

Neonatal sepsis is defined as a clinical condition of bacteremia with clinical features of infection in the first 28 days of life. When bacteria enter into the bloodstream, they may cause

overwhelming infection without localization; called septicemia, or may get localized to the lungs resulting in pneumonia, or the meninges causing meningitis.¹⁻⁶ Early-onset and late-onset sepsis are defined based on presentation within 72 hours or after 72 hours of birth respectively. There are many risk factors for the development of neonatal sepsis. The present study is carried out to overview the clinical and investigations profile and outcome of neonatal sepsis admitted in a NICU.

Materials and Methods

This study included newborns diagnosed with neonatal sepsis

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admitted to the NICU of Khwaja Yunus Ali Medical College and Hospital, Sirajonj from October 2020 to January 2022. It is a retrospective descriptive study. The case records of 50 neonatal sepsis. The case records of these newborns were thoroughly studied and recorded for relevant information including a detailed history, clinical examination, and available investigations favoring the diagnosis of neonatal sepsis. The diagnosis of neonatal sepsis was based on history, clinical profile, septic screen, radiology, and blood culture. Outcomes of neonatal sepsis were also noted.

Results

Among the 50 neonatal sepsis cases clinical features on admission were reluctant to feed 35(70%), fever 33(66%), less active or less alert or less movement 22(44%), shock 22(44%), respiratory distress or grunting 21 (42%), jaundice 20 (40%), lethargic 19 (38%), vomiting 13(26%), bleeding manifestation 12(24%), cyanosis 11(22%), convulsion 11(22%), abdominal distension 8(16%), hypothermia 7(14%), apnea 6(12%), diarrhea 3(6%), fontanels bulge or full 3(6%), excessive cry 3(6%), umbilical discharge or peri-umbilical redness 3(6%), chocking 2(4%), multiple skin pustules 2(4%), oliguria / anuria 2(4%).(Table I)

Table I: Presenting clinical features of neonatal sepsis (N=50)

Clinical features	Number (n)	Frequency (%)
Reluctant to feed	35	70
Fever	33	66
Less active or less alert or less movement	22	44
Shock (CRT >3 sec)	22	44
Respiratory distress or grunting	21	42
Jaundice	20	40
Lethargic	19	38
Vomiting	13	26
Bleeding manifestation	12	24
Cyanosis	11	22
Convulsion	11	22
Abdominal distension	8	16
Hypothermia	7	14
Apnea	6	12
Diarrhea	3	6
Fontanels bulge or full	3	6
Excessive cry	3	6
Umbilical discharge or periumbilical redness	3	6
Chocking	2	4
Multiple skin pustules	2	4
Oliguria / anuria	2	4

Among the 50 neonatal sepsis cases, early-onset neonatal sepsis was 28(56%), late-onset neonatal sepsis was 22(44%). (Table II)

Table II: Classification of neonatal sepsis (N=50)

Neonatal sepsis	Number (n)	Frequency (%)
Early -onset neonatal sepsis (Within 1 st 72 hours of birth)	28	56
Late onset neonatal sepsis (after 72 hours of birth)	22	44
Total	50	100

Among the 50 neonatal sepsis cases preterm 37(74%), term 11(22%), post-term 2(4%) were found. (Table III)

Table III: Distribution of neonatal sepsis according to gestational age (N=50)

Gestational age	Number (n)	Frequency (%)
Preterm (< 37 weeks)	37	74
Term (37 to 42 weeks)	11	22
Post term (>42 weeks)	2	4
Total	50	100

Among the 50 neonatal sepsis cases low birth weight 22(44%), very LBW 10(20%), normal birth weight 9(18%), extreme LBW 2(4%), incredible LBW 3(6%), large baby 2(4%) were found. (Table IV)

Table IV: Distribution of neonatal sepsis according to birth weight (N=50)

Weight	Number (n)	Frequency (%)
Large baby	2	4
Normal birth weight	9	18
Low birth weight	22	44
Very LBW	10	20
Extreme LBW	4	8
Incredible LBW	3	6
Total	50	100

Neonatal sepsis accounted for 39 (78%) in the outborn and 11 (22%) in the inborn. (Table V)

Table V: Distribution of neonatal sepsis according to the place of birth (N=50)

Sepsis cases	Number (n)	Frequency (%)
Out born	39	78
Inborn	11	22
Total	50	100

Among the 50 neonatal sepsis cases septicemia only 18(36%), pneumonia 7(14%), Necrotizing enterocolitis / neonatal intesti

nal obstruction 5(10%), congenital pneumonia 4(8%), umbilical sepsis 3(6%), covid-19 3(6%), meconium aspiration syndrome 2(4%), meningitis 2(4%), AKI 2(4%), pyoderma 2(4%), DIC 2(4%) were found. (Table VI)

Table VI: Pattern of neonatal sepsis (N=50)

Patterns	Number (n)	Frequency (%)
Septicemia only	18	36
Pneumonia	7	14
Necrotizing enterocolitis / neonatal intestinal obstruction	5	10
Congenital pneumonia	4	8
Umbilical sepsis	3	6
Covid -19	3	6
Meconium aspiration syndrome	2	4
Meningitis	2	4
AKI	2	4
Pyoderma	2	4
DIC	2	4
Total	50	100

Among the 50 neonatal sepsis cases, septic screening profiles were thrombocytopenia 42(84%), CRP 39(78%), leukopenia 29(58%), anemia 13(26%), positive chest x-ray findings 12(24%), leukocytosis 11(22%), normal 10(20%), positive abdominal x-ray findings 8(16%), toxic granules or band form neutrophil in PBF 7(14%), positive blood culture 7(14%), positive CSF findings 2(4%). (Table VII)

Table VII: Septic screening profile of neonatal sepsis (N=50)

Septic screening	Number (n)	Frequency (%)
Thrombocytopenia	42	84
CRP	39	78
Leukopenia	29	58
Anemia	13	26
Positive chest x-ray findings	12	24
Leukocytosis	11	22
Normal	10	20
Positive abdominal x-ray findings	8	16
Toxic granules or band form neutrophils in PBF	7	14
Positive blood culture	7	14
Positive CSF findings	2	4

Among the 50 neonatal sepsis cases, probable risk factors were low birth weight 39(78%), prematurity 37(74%), perinatal asphyxia 29(58%), home trial 28(56%), prolonged rupture of membrane 22(44%), prolonged labor 22(44%), pre lacteal feed 16(32%), unidentified 13(26%), maternal fever 13(26%), meconium-stained liquor 11(22%), mechanical ventilation/invasive procedure 2(4%). (Table VIII)

Table VIII: Probable risk factors for neonatal sepsis (N=50)

Probable risk factors	Number (n)	Frequency (%)
Low birth weight (<2.5kg)	39	78
Prematurity (<37 weeks)	37	74
Perinatal asphyxia	29	58
Home trial	28	56
Prolong rupture of membrane (> 18hours)	22	44
Prolonged labor (>24 hours)	22	44
Pre lacteal feed: formula, honey, sugar solution, bottle feed	16	32
Unidentified	13	26
Maternal fever within 2 weeks of delivery	13	26
Meconium stained liquor	11	22
Mechanical ventilation/invasive procedure	2	4

Among the 50 neonatal sepsis cases survived 32 (64%), death 18(36%) were found. (Table IX)

Table IX: Outcome of neonatal sepsis (N=50)

Outcomes	Number (n)	Frequency (%)
Survived	32	64
Death	18	36
Total	50	100

Discussion

Sepsis is the commonest cause of neonatal morbidity and mortality. It is responsible for about 30-50% of total neonatal deaths.^{3,4} Sepsis-related morbidities and mortality are largely either preventable or treatable with rational antimicrobial and supportive therapy.

In the present study majority of clinical presentations were reluctant to feed (70%), fever (66%), less active or less alert or less movement (44%), shock (44%), respiratory distress, or grunting (42%). Another study found that maximum neonates presented with refuse to feeds (74%), respiratory distress (75%), and fever (69%); which is similar to our study.⁷ In a study done in the tertiary care center in Bangladesh poor feeding, respiratory distress, and fever were reported in 22.2%, 27.8%, and 44.4% cases respectively.⁵ In the same study they documented hypothermia in 11.1%, apnea in 16.7%, cyanosis in 11.1%, convulsions in 11.1%, and jaundice in 50% as compared to our findings 14%, 12%, 22%, 22%, and 40% respectively.

Among the neonatal sepsis cases in our study, early-onset neonatal sepsis was (56%) more than late-onset neonatal sepsis

(44%). Early-onset sepsis was significantly more as compared to late-onset neonatal sepsis. Early-onset neonatal sepsis is more common because of many perinatal risk factors.⁷

In this study, neonatal sepsis cases were found mostly in preterm (74%) and LBW (44%) and very LBW (20%) babies. In another study, birth weight is inversely related to the development of neonatal sepsis.⁷

Neonatal sepsis accounted for (78%) in the outborn and (22%) in the inborn. Neonatal sepsis accounted for (59%) in the outborn and (35%) in the inborn category in another study.⁷

Among the 50 neonatal sepsis cases septicemia only (36%), pneumonia (14%), Necrotizing enterocolitis / neonatal intestinal obstruction (10%), congenital pneumonia (8%), umbilical sepsis (6%), covid-19 (6%), meconium aspiration syndrome (4%), meningitis (4%), AKI (4%), pyoderma (4%), DIC (4%) were found in this study. Neonatal bacterial meningitis, neonatal pneumonia occur in 25%, 8.4 % respectively of neonates with bacteremia.^{8,9} Necrotizing enterocolitis (NEC) occurs in up to 5% and AKI 20 % of admissions to the neonatal intensive care unit.^{10, 11} Many studies contributes neonatal sepsis with covid-19.^{12,13}

Though the gold standard for the diagnosis of sepsis is positive blood culture sometimes there is a limited blood sample from newborn, prior use of antibiotics before admission, critically ill newborn and some other factors, then diagnosis by clinical plus septic screening, radiology, CSF examination or other relevant investigations were done whenever clinically indicated. In our study septic screening profile were thrombocytopenia (84%), CRP (78%), leukopenia (58%), anemia (26%), positive chest x-ray findings (24%), leukocytosis (22%), normal (20%), positive abdominal x-ray findings (16%), toxic granules or band form neutrophil in PBF (14%), positive blood culture (14%), positive CSF findings (4%) were found. Blood culture positive was found 13.9 % and 11% respectively in another two studies in Bangladesh. Early diagnosis of neonatal sepsis by evaluation of hematological scoring system (HSS) done by an author at Dhaka Shishu hospital; where thrombocytopenia, leukopenia, leukocytosis, toxic granules, CRP got the great value.^{14,15}

In the present study, among the 50 neonatal sepsis cases, probable risk factors were low birth weight (78%), prematurity (74%), perinatal asphyxia (58%), home trial (56%), prolonged rupture of membrane (44%), prolonged labor (44%), pre lacteal feed (32%), unidentified (26%), maternal fever (26%), meconium-stained liquor (22%), mechanical ventilation/invasive procedure (4%).

In this study, there were overlapping of many factors. By another study LBW, babies are the strong risk factors for neonatal sepsis.⁷ LBW is a strong risk factor contributing to neonatal sepsis and LBW was found to be an important risk factor for sepsis by another two studies. LBW babies are mostly also premature and are predisposed to sepsis due to multiple reasons.^{6, 16}

In this study among neonatal sepsis cases death was 36%. Mortality due to sepsis was 18.5% in a study with an overall mortality of 10.2%.^{6,7} Overall mortality is reported 30-50% of total neonatal deaths in the community and rural India.^{3,4} The difference in mortality may occur due to our data being single-centered NICU-based.

Conclusion

In the neonatal intensive care unit, mostly early-onset neonatal sepsis has been observed in outborn, premature, and LBW babies presenting with reluctance to feed with associated risk factors; where thrombocytopenia invariably found in sepsis screening and survival rate around sixty-five percent.

Acknowledgments

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References

1. Management of neonatal sepsis, IAP-NNF (Indian Academy of Pediatrics- National Neonatology Forum) Guidelines 2006 on level II neonatal care: 159-186.
2. Chaiko B and Sohi I, Early-onset neonatal sepsis. Indian Journal of Pediatrics 2005; 72: 23-26.
3. Bang AT, Bang RA, Bactule SB et al. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999; 354: 1955-1986.
4. Stoll BJ. The global impact of neonatal infection. Clin Perinatol 1997; 24: 1-21.
5. Ahmed NU, Chowdhary A, Hoque M et al. Clinical and bacteriological profile of neonatal septicemia in a tertiary level pediatric hospital in Bangladesh. Indian Pediatrics 2002; 39: 1034-1039.
6. Khinchi YR, Shreshta D, Sarmah BK et al. A study of morbidity and mortality profile of neonates admitted in tertiary care hospital in central Nepal. Journal of College of Medical Sciences, Nepal, 2008; 5: 70-75.
7. Khinchi YR, Kumar A, Yadav S. Profile of Neonatal sepsis. Journal of college of Medical Sciences-Nepal 2010; 6(2):1-6.
8. Khalessi N, Afsharkhas L. Neonatal meningitis: risk factors, causes, and neurologic complications. Iran J Child Neurol. 2014; 8(4):46-50.
9. Mannan M, Nahar N, Ahmed F, Jahan I, Mosleh T, Khan KA, Dey SK, Shahidullah M. Neonatal Pneumonia in NICU of a Tertiary Care Center. Bangladesh J Child Health 2018; 42(3):112-117.

10. Pammi M, Abrams SA. Enteral lactoferrin for the treatment of sepsis and necrotizing enterocolitis in neonates. *Cochrane Database Syst Rev.* 2019; 5(5):CD007138.
11. Coggins SA, Laskin B, Harris MC, Grundmeier RW, Passarella M, McKenna KJ, Srinivasan L. Acute Kidney Injury Associated with Late-Onset Neonatal Sepsis: A Matched Cohort Study. *J Pediatr.* 2021; 231:185-192.
12. Coronado Munoz A, Nawaratne U, McMann D, Ellsworth M, Meliones J, Boukas K. Late-Onset Neonatal Sepsis in a Patient with Covid-19. *N Engl J Med.* 2020; 382(19):
13. Ryan L, Plötz FB, van den Hoogen A, Latour JM, Degtyareva M, Keuning M, Klingenberg C, Reiss IKM, Giannoni E, Roehr C, Gale C, and Molloy EJ. Neonates and COVID-19: state of the art: Neonatal Sepsis series. *Pediatr Res.* 2022; 91(2):432-439.
14. Ghosh UK, Hossain MM, Shirin M, Hoque MS, Sonia SF, Islam T. Predictors of Ventilator-Associated Pneumonia of Neonate in a Neonatal and Paediatric Intensive Care Unit. *Bangladesh J Child Health* 2019; 43(2): 90-96.
15. Yusuf MM, Aiam J, Hussain MM, Chowdhury MAK. Evaluation of hematological scoring system (HSS) for early diagnosis of neonatal sepsis. *Dhaka Shishu (Children) Hospital Journal* 2014; 30(1): 14-19.
16. Jeeva Sankar M, Agrawal R, Deorari AK et al. Sepsis in newborn. *Indian J Pediatr* 2008; 75: 261-266.