Original Research Article

International Journal of Medical Science and Education | pISSN- 2348 4438 | eISSN-2349- 3208

AETIOLOGY AND PRESENTATION OF NEONATAL SEPTICAEMIA AT TERTIARY CARE HOSPITAL OF SOUTHERN RAJASTHAN

Dr.Deepandra Garg[1*], Dr.Neha Agrawal[2]

1 Associate professor, Dept. of Peadiatrics, Geetanjali Medical College and Hospital, Udaipur (Rajasthan)

2 Resident Dept. of Radiology, JLN Medical College and Hospital, Ajmer (Rajasthan)

***Email id of corresponding author: deependragarg17@yahoo.com**

Received: 22/09/2013 ***Revised: 15/10/2013*** ***Accepted:27/10/2013***

Abstract:

Objective: Sepsis is the one of the common cause of neonatal mortality. The aetiology of neonatal sepsis has variations according to the various customs and practices in the perinatal and neonatal period and geographical area. This study was designed to analysis the magnitude and aetiological characteristics of neonatal sepsis. **Martial and Methods:** This descriptive study included 35 full-term neonates of birth weight >2.5 kg admitted in Nursery Balchikitsalaya RNT Medical College, Udaipur (Lodger and intramural). The study was carried out during the month of March to May of year 2006. A structured Performa was used to collect the information for the baseline characteristics like age, gender, birth weight, gestational age, mode of delivery of the neonate and age of onset of illness. **Results:** Out of 35 full-term neonates with neonatal sepsis were included in the study by consecutive sampling. The most common bacteria grown was coagulase negative staphylococcus (CONS) (28.57%) followed by coagulase positive staphylococcus (21.42%) and streptococcus fecalis (14.28%). Other organism grown in blood culture are α--hemolytic streptococci in one case (7.14%), Klebsiella in one case (7.14%), proteus in one case (7.14%), and E. coli in one case (7.14%).lastly one case of blood culture showed Candida albicans. **Conclusion:** Most common organisms were coagulase negative staphylococcus (CONS) (28.57%) followed by coagulase positive staphylococcus (21.42%)

Keywords: Neonatal sepsis, Sensitivity and resistance, Antibiotics, organisms

INTRODUCTION:

Neonatal sepsis is a common cause of neonatal morbidity and mortality worldwide. **(1)**It contributes to 6 million deaths per year and nearly accounts for 40% of deaths in first weeks of life. Its incidence in developed countries varies from 1-10/1000 live births, where as it is 3 times more common in India. **(2)** Newborn is a relatively compromised host who is unable to localize the infection and bacterial sepsis can

frequently involve vital organs including meninges. Sepsis neonatrum is the completely curable life-threatening disease of the newborn. Prompt institution of specific anti-bacterial therapy can be life saving and can reduce neonatal morbidly and mortality up to a large extent.

The exact reason is unknown but geographical, socioeconomic, seasonal and prevalent use of various antibiotics may play an important role. **(3, 4)** Most infants with suspected sepsis recover with supportive care (with or without initiation of antimicrobial therapy). The paediatrician faces three challenges: **(5)** early recognition of neonates with a high probability of sepsis quickly and starting antimicrobial therapy; **(6)** differentiate "high-risk" healthy-appearing infants or infants with clinical signs who do not require treatment; and **(7)** are stopping the therapy once sepsis is consider not expected.

Bacterial organisms causing neonatal sepsis in developed countries and developing countries are different. Information about Incidence and prevalence of bacteria responsible for neonatal septicaemia is very crucial for management of this simultaneously there have been an increase in antibiotic resistance over the past two decades which is due to mutant forms of common bacteria, overuse, or under use or inappropriate use of broad spectrum antibiotics and poor infection control in maternity and neonatal units. **(8, 9)**

This study was designed to determine clinical presentation and bacteriological spectrum to develop new preventive strategies at department of Neonatology, RNT Medical College and Hospital, Udaipur.

MATERIALS AND METHODS

A total of 35 full-term neonates of birth weight >2.5 kg admitted in Nursery Balchikitsalaya RNT Medical College, Udaipur (Lodger and intramural) were included.The study was carried out during the month of March to May of year 2006.

Inclusion criteria were :

Symptoms and signs suggestive of septicemia with positive sepsis screen**.(10)**

Exclusion Criteria

1. Neonates with birth asphyxia (APGAR score <5 at 5 minutes).
2. Neonates with Meconium aspiration syndrome.
3. Neonates who had previously received antibiotics in any form.
4. Patient undergoing surgery or major chromosomal / congenital malformation.
5. Neonates <1.5 kg and gestational age <28 weeks.

Methods

- After the first clinical suspicion of infection, blood was taken for blood culture, blood cell count with differential and quantitative CRP and micro ESR.
- Antibiotic therapy with a standard regimen of Ampicillin/Cefotaxim and Gentamycin/Amikacin was started in all neonates with suspension of septicemia.
- Sepsis screen was done on the time of admission i.e. 0 hours and then again at 4^{th} day i.e. after 72 hours and again on

8th day i.e. 168 hours and if sepsis screen is not negative on 8th day then again on 14th day.

- Antibiotics were stopped whenever CRP levels are <10mg/L.
- The neonates were also evaluated clinically daily.

Blood Culture

It is considered gold standard for infection. Skin is cleaned for 30 seconds with sprite (70% methylated ethyl alcohol).Under aseptic precautions, 1 ml blood added to unvented culture bottle containing 5-10 ml liquid enriched tryptic Soya broth. Blood culture incubated for 72 hours before being considered negative. The good yield of culture can be attributed to the fact that blood culture were taken in micro culture broth tubes in 1:10 dilution. Special small test tubes containing 5-10 ml of glucose broth were used and a small amount of sample i.e. 0.5-10 ml (10 to 20 drops) blood was sufficient for analysis. These sample containing bottles were immediately sent to laboratory and if it was not possible, they were not kept in refrigerator and stored at room temperature.

RESULTS

In present study 35 full-term neonates of birth weight >2.5 kg were included who suffered from septicemia, confirmed by clinical examination, different blood tests and blood culture. Out of which 25 (71.4%) were male and 10 (28.6%) were female neonates.

18 cases (51.43%) were of early onset type (<72 hrs) and 17 cases (48.57%) were late onset type (>72 hrs). Further, 5 cases (27.78%) expired in early onset group and one case (5.26%) expired in late onset group. This is statistically significant ($p<0.05$). More than three forth (77%) were delivered outside the hospital i.e. lodger and 23% were intramural. Mortality statistics showed that death was also more in lodger group i.e. 5 cases (18.57%) as compared to intramural 1 (12.5%).

History of >3 per vaginal examination was the commonest maternal risk factor for neonatal septicemia. Considering the presence of maternal risk factors and occurrence of neonatal septicaemia showing that history of >3 per vaginal examination was the most important risk factor for developing neonatal septicaemia. It was present in 42.85% of cases followed by PROM >12 hrs in 12 cases (34.28%).

A look at the data regarding vital signs and clinical features on admission table 1 revealed that refusal to feed was commonest presenting symptoms (100%) and poor sucking /swallowing was commonest sign (85.7%). Fever (22.8%), icterus (25.7%) and sclerama (8.5%) were other signs and symptoms. This indicates that refusal to feed is most important and earliest symptom to suspect neonatal septicaemia and it should not be ignored and every child of refusal to

Table No. 1 Signs & symptoms on Admission

S.No.	Signs	No. of patients	Percentage
1	Fever on admission	8	**22.8%**
2	Icterus on admission	9	**25.7%**
3	Cyanosis on admission	7	**20.0%**
4	Sclerema on admission	3	**8.5%**
5	Hepatomegaly on admission (>2cm BCM)	7	**20.0%**
6	Splenomegaly on admission	6	**17.14%**
7	Perfusion poor (i.e. CRT > 3 sec.)	8	**22.8%**
S.No.	**Symptoms**	**No. of cases**	**%**
1	Fever	8	**22.8%**
2	Not well	9	**25.7%**
3	Refusal to feed	35	**100%**
4	Convulsion	5	**14.2%**
5	GIT symptoms	16	**45.7%**
6	RS symptoms	18	**51.4%**
7	CVS symptoms	9	**25.7%**
8	CNS symptoms	14	**40.0%**
9	Hematological symptoms	11	**31.4%**
10	**Others symptoms**	**6**	**17.1%**

feed should have a detailed clinical and laboratory evaluation so that early diagnosis of neonatal septicaemia can be made and treated.

Table 1 also shows that commonest systemic complaint was related to respiratory systems (51.4%) in the form of (grunting, nasal flaring, retraction) followed by gastrointestinal system (45.7%), central nervous system (40.0%) and haematological (31.4%).

Among GI manifestations of neonatal septicaemia, the commonest symptom was abdominal distension (56.25%) followed by hepatomegaly >2cm. BCM (43.75%), vomiting (37.25%) and diarrhoea (12.5%).The commonest GIT symptom was abdominal Distention.

The commonest systemic complaints were related to respiratory system in the form of dyspnea (Grunting, nasal flaring and retraction).

The commonest CVS Manifestation of septicemia was poor perfusion (CRT >3 sec.) It support the fact that neonatal septicemia has rapid downhill course and if not timely diagnosed and managed, may leads to irreversible stage of septic shock and fulminate outcome.

The commonest CNS manifestation of septicemia is lethargy. (85.7%) followed by abnormal moro (42.9%), seizures (35.7%) and high pitch/ inconsolable cry (28.6%).The jaundice (81.8%) was commonest hematological manifestation of

neonatal septicemia followed by pallor (54.5%) and splenomegaly (84.5%).

The blood culture were positive in 14 cases (40%) and were negative in 21 (60%) cases. 21.4% deaths were in culture positive and 14.35% in culture negative group respectively. The regression analysis revealed statistically significant correlation between mortality and culture positivity.

The most common bacteria grown was coagulase negative staphylococcus (CONS) (28.57%) followed by coagulase positive staphylococcus (21.42%) and streptococcus fecalis (14.28%).

Other organism grown in blood culture are α-hemolytic streptococci in one case (7.14%), Klebsiella in one case (7.14%), proteus in one case (7.14%), and E. coli in one case (7.14%).lastly one case of blood culture showed Candida albicans. Out of all culture positive cases, only one case was Candida albicans positive, remaining 13 cases tested positive for various bacterial pathogens.

Table No. 2 Organisms Isolated from Blood Culture

Organisms	No. of cases	%
Coagulase –ve staphylococcus (CONS)	4	**28.57%**
Coagulase +ve staphylococcus	3	**21.42%**
Streptococcus fecalis (gr. D. streptococcus)	2	**14.28%**
α- Hemolytic streptococcus	1	**7.14%**
Klebsiella sp.	1	**7.14%**
Proteus	1	**7.14%**
E. coli.	1	**7.14%**
Candida albicans	**1**	**7.14%**

DISCUSSION

Neonatal sepsis is a common cause for admission to neonatal units in developing countries. It is also increase Neonatal Mortality Rate in developed as well as in developing countries.**(11, 12)**

A total of 35 term neonates (wt >2-5kg) lodger and intramural were included in the study, out of which 25 (71.4%) were male & 10 (28.6%) were female neonates (**Table No. 1**).The male to female ratio being 2.5:1; our results are equivalent with the other studies **(11, 12)**. The mortality was highest 5 (20%) in male group & 1 (12.5%) was in female group. A high male prevalence in neonatal septicemia may be correlated well to the X- linked immunoregulatory gene factor which makes male infants are more prone to infection, disease and death. **(13)**

18 cases (51.43%) were of early onset type (<72 hrs) and 17 cases (48.57%) were late onset type (>72 hrs). Further, 5 cases (27.78%) expired in early onset group and one case (5.26%) expired in late onset group. This is statistically significant ($p<0.05$). This indicates that early onset septicemia carried a poor prognosis. An another study by F Motara et al showed different results that neonatal septisemia was more prevalent in late onset group but CK Shaw et al study from Nepal showed same results as our study ,this may be because of geographical differences or other factor, which may differs in developing and developed countries.**(14,15)** Early onset and

late onset Neonatal sepsis have different risk factors. The Maternal fever with or without chorioamnionitis and the maternal genital flora are primarily implicated in early onset septicaemia (first week) while the duration of hospital stay with or without invasive procedures and invasive strains of organisms colonizing after birth may give results in late onset ticaemia (onset > 7 days).Immature immune system of the neonate and the opportunity of infectious agent to spread infection may ensnare the compromised neonate. **(16)**

More than three forth (77%) were delivered outside the hospital i.e. lodger and 23% were intramural. Mortality statistics showed that death was also more in lodger group i.e. 5 cases (18.57%) as compared to intramural 1 (12.5%). Results were similar with CK Shaw etal study. **(15)** Early onset sepsis is also correlated well with leaking per vaginum > 24 hours and unclean methods of per-vaginal examination (home deliveries). In case of the intramural sepsis, the data for the high vaginal swab and amniotic membrane cultures was inconsistent due to lack of reports and hence was not taken into account. This may be a lacuna in the study. Nosocomial sepsis results from invasion of the hospital flora colonizing the skin and indwelling catheters of the neonate. This is reflected in our analysis as prolonged hospital stay, exchange transfusions, invasive ventilation and major surgery were most frequently associated with nosocomial sepsis cases. Recycling of catheters/ tubes, maintaining stock solutions and the use of multi-dose vials of antibiotics are other potential sources which commonly escape notice! **(17).**

history of >3 per vaginal examination was the most important risk factor for developing neonatal septicemia. It was present in 42.85% of cases followed by PROM >12 hrs in 12 cases (34.28%). This revealed the fact that frequent per vaginal examination is associated with more chance of neonatal septicaemia, which is also well suggested by Belady PH et al study. **(18)** By reducing per vaginal examination and proper cleaning of perineum before per vaginal examination can deduce the hazards of infection to the newborn significantly.

A look at the data regarding vital signs and clinical features on admission table 6 and 7 revealed that refusal to feed was commonest presenting symptoms (100%) and poor sucking /swallowing was commonest sign (85.7%). Fever (22.8%), icterus (25.7%) and sclerama (8.5%) were other signs and symptoms. This indicates that refusal to feed is most important and earliest symptom to suspect neonatal septicemia and it should not be ignored and every child of refusal to feed should have a detailed clinical and laboratory evaluation so that early diagnosis of neonatal septicemia can be made and treated. Table 1 shows system wise manifestation of neonatal septicaemia. It revealed that commonest systemic complaint was related to respiratory systems (51.4%) in the form of (grunting, nasal flaring, retraction) followed by gastrointestinal system (45.7%), central nervous system (40.0%) and haematological (31.4%)The clinical presentation was somehow similar to the study done in Nepal. **(15)** It may be

because same geographical and cultural habits of India and Nepal.

The commonest Gastrointestinal symptom was abdominal distention (56.25%) followed by hepatomegaly >2cm. BCM (43.75%), vomiting (37.25%) and diarrhea (12.5%).poor perfusion i.e. CRT >3 sec was chief cardiovascular manifestation. It support the fact that neonatal septicemia has rapid downhill course and if not timely diagnosed and managed, may leads to irreversible stage of septic shock and fulminate outcome.

The commonest CNS manifestation of septicemia is lethargy. (85.7%) followed by abnormal moro (42.9%), seizures (35.7%) and high pitch/ inconsolable cry (28.6%).Jaundice (81.8%) was commonest hematological manifestation of neonatal septicemia followed by pallor (54.5%) and splenomegaly (84.5%).

Table 2 shows that blood culture were positive in 14 cases (40%) and were negative in 21 (60%) cases. About 21.4% deaths were in culture positive and 14.35% in culture negative group respectively. The regression analysis revealed statistically significant correlation between mortality and culture positivity. Different studies showed a culture positive rate ranging from 41.6 to 46.2.**(19,20)** which equivalent to our study.

The most common bacteria grown was coagulase negative staphylococcus (CONS) (28.57%) followed by coagulase positive staphylococcus (21.42%) and streptococcus fecalis (14.28%). Although these results may be of equivocal significance, reflecting either contamination or true bacteremia, but because all 4 cases (28.57%) of blood culture growing coagulase negative staphylococci were also accompanied by an increase of CRP to >10 mg/L. So that the predominance of coagulase negative staphylococci (CONS) in this study is probably true and not caused by contamination. A study from Port Harcourt showed Klebsiella pneumonia as commonest organism. **(19)** An another study done in Pakistan showed most common pathogen in sepsis was Enterobactor (48%).**(21)**

Other organism grown in blood culture are α-hemolytic streptococci in one case (7.14%), Klebsiella in one case (7.14%), proteus in one case (7.14%), and E. coli in one case (7.14%).

Table 2 is showing an interesting observation that one case of blood culture showed Candida albicans and delayed fungal culture after 14 days. The explanations offered by microbiologists were a risk of contamination or probably rampant use of broad spectrum antibiotics in NICU which predispose newborn to fungemia. Some other study also observed Candida as etiological factor of neonatal septicaemia.**(22)**

CONCLUSION

The causative microbes of neonatal sepsis varies with the time and differs in different regions it may be due to changes in cultural taboos in different regions and awareness about hygiene and availability of health resources. Most common organisms were coagulase negative staphylococcus (CONS) (28.57%) in this study. Judicious and prudent use of antibiotics should be

implemented to avoid unnecessary bacterial resistance.

Information in relation to the etiology and clinical presentation of neonatal sepsis in India are limited. This study provide the data about neonatal sepsis of the south Rajasthan region but imperative future research is needed, including high disease burden area where there is a lack of data. For the strengthening of Health system the planning of organized and combined research using same criteria is recommended to observe neonatal sepsis etiology, Clinical feature and record antimicrobial sensitivity patterns.

Precise etiological data and knowledge of clinical features are helping in Neonatal sepsis prevention and management, which further make a significant improvement in the community Health. Achievement of Millennium Development Goal 4 is very crucial for India. It may possible by the early identification and treatment of the infecting organism to reduce neonatal mortality rates.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCE

1. Stoll BJ. Infections of the neonatal infant. In:Behrman RE, Kleigman RM, Jenson HB (eds.) Nelson textbook of pediatrics.17th ed. Philadelphia Saunders 2004; p 623-640.

2. Singh M; Care of the newborn; 6th edition; Meharban Singh, Sagar Publications ; page 212 220.

3. Aurangzeb B, Hameed A. Neonatal sepsis in hospital born babies: Bacterial isolates and antibiotic susceptibility patterns. J Coll Physicians Surg Pak 2003; 13: 629-32.

4. Haque KN, Khan MA, Kerry S, Stephenson J, Woods G.Pattern of culture-proven neonatal sepsis in a district general hospital in the United Kingdom. Infect Control
Hosp Epidemiol 2004;25: 759-64.

5. 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;103(1, suppl E):360–373

6.Polin RA, St Geme JW III. Neonatal sepsis. Adv Pediatr Infect Dis. 1992;7:25–61

7. Riley LE, Celi AC, Onderdonk AB, et al. Association of epidural-related fever and noninfectious inflammation in term labor. Obstet Gynecol. 2011;117(3):588–595

8. Kapoor L, Randhawa VS, Deb M. Microbiological profile of neonatal septicemia in a pediatric care hospital in Delhi. J Commun Dis 2005; 37: 227-32.

9.Tom-Revzon C. Strategic use of antibiotics in the neonatal intensive care unit. J Perinat Neonatal Nurs. 2004 Jul-Sep;18(3):241-58.

10. Rhiskesh Thakre. Neonatal sepsis screen. Pediatrics Today 2005 VIII No. 3, 174-176.

11.YR Khinchi AK, Satish Yadav. Profile of Neonatal sepsis. Journal of college of

Medical Sciences-Nepal. 2010; Vol.6(No-2):p1-6.
12. Rekha Sriram IJBMR. Correlation of blood culture results with the sepsis score and the sepsis screen in the diagnosis of neonatal septicemia. BioMedSciDirect publications; 2011. p. 360-8.
13. Sharma M, Goel N, Chaudhary U, Aggarwal R, Arora DR. Bacteraemia in children. Indian J Pediatr. 2002;69(12):1029-32.
14.F.Motara F,BallotDE,Perovic O. Epidemiology of neonatal sepsis at Johannesburg hospital.The south African Journal of Epidemiology and infection.2005;20(3)90-93
15. Shaw CK, Shaw P, Malla T, Malla K.K.The clinical spectrum and outcome of neonatal sepsis in a neonatal intensive care unit at a tertiary care hospital in western Nepal: January 2000 to December 2005 – A retrospective study. Eastern Journal of Medicine 17 (2012) 119-125
16. Oddie S, Embleton ND. Risk factors for early onset neonatal group B streptococcal sepsis: case-control study. BMJ 2002 10; 325: 308.
17. Singh M, Paul VK, Deorari AK, et al. Strategies which reduced sepsis-related neonatal mortality. Indian J Pediatr 1988; 55: 955-960.
18. Belady PH, Farkouh LJ, Gibbs RS. Intraamniotic infections and premature rupture of membranes. Clin Perinatol. 1997 Mar;24(1):43-57.
19. West and Peterside: Sensitivity pattern among bacterial isolates in neonatal septicaemia in Port Harcourt. Annals of Clinical Microbiology and Antimicrobials 2012 11:7.
20.Desai KJ,Malek SS. Neonatal Septicemia: Bacterial Isolates & Their Antibiotics Susceptibility Patterns.NJIRM 2010; Vol. 1(3);12-15
21. Rizvi F., Afzal M., Khan A, and Wahid S. Bacterial Sensitivity in Neonatal Sepsis. Journal of Islamabad Medical & Dental College (IM&DC); 1211(1):1-5
22.Bode-Thomas F, Ikeh EI, Pam SD, Ejeliogu EU. Current aetiology of neonatal sepsis in Jos University Teaching Hospital. Niger J Med 2004; 13: 130-5.