International Journal of Research in Medical Sciences
Samaga MP. Int J Res Med Sci. 2016 Jul;4(7):2812-2816
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20161956

Research Article

Prevalence of neonatal septicaemia in a tertiary care hospital in Mandya, Karnataka, India

Mamatha P. Samaga*

Department of Microbiology, MIMS, Mandya, Karnataka, India

Received: 12 May 2016
Accepted: 04 June 2016

***Correspondence:**
Dr. Mamatha P. Samaga,
E-mail: mam43@rediffmail.com

ABSTRACT

Background: Neonatal sepsis is defined as a clinical syndrome in an infant 28 days of life or younger, manifested by systemic signs of infection and isolation of a bacterial pathogen from the bloodstream. Neonatal sepsis is caused by Gram-positive and Gram-negative bacteria and candida. Microbial invasion of the bloodstream can have serious consequences such as shock, multi-organ failure, disseminated intravascular coagulation (DIC) and death. This study was conducted to know the prevalence of neonatal septicaemia.
Methods: This retrospective observational study was conducted in the Department of Microbiology. The data was collected from the records of the Department for a period of one year (January 2014- December 2014).
Results: Among 128 blood samples processed from clinically suspected neonatal septicaemic cases, 45 (35.1%) samples showed growth. Among 45 isolates, 22 were from early onset septicaemia (EOS) and 23 were from Late Onset Septicaemia (LOS). Among 45 culture positives, 32 (71.1%) were from males and 13(28.9%) were from females, thus showing a male preponderance. *Klebsiella pneumoniae* and *Candida* were the major isolates, 37.8% each. The antibiotic sensitivity showed that most of the Gram negative bacteria were highly resistant to the commonly used antibiotics like Ampicillin and Gentamicin. Gram positive bacteria showed 100% sensitivity to linezolid and Gram negative bacteria showed more than 90% sensitivity to imipenem.
Conclusions: Development of sepsis in neonates is a medical emergency and generally the clinicians do not wait for microbiology report and start treatment empirically. If local microbiological databases are available with information regarding the commonly isolated organisms and their drug resistance patterns, it can help the clinicians in empirical therapy.

Keywords: Neonatal sepsis, *Klebsiella pneumoniae*, Candida, Early onset septicaemia, Late onset septicaemia

INTRODUCTION

Neonatal sepsis is defined as a clinical syndrome in an infant 28 days of life or younger, manifested by systemic signs of infection and isolation of a bacterial pathogen from the bloodstream.[1]

Sepsis occurring in the first 72 hours of life is defined as early-onset sepsis (EOS) and that occurring beyond 72 hours as late-onset sepsis (LOS).[2] Neonatal sepsis is caused by Gram-positive and Gram-negative bacteria and Candida.[3] In most developing countries, gram negative bacteria remain the major source of infection.[4] However, in the developed countries, Gram positive organisms have been implicated as the most common causes.[5]

The spectrum of organisms that causes neonatal sepsis changes over times and varies from region to region. This is due to the changing pattern of antibiotic use and changes in lifestyle.[6] Globally, sepsis is still one of the major causes of morbidity and mortality in neonates, in

spite of recent advances in health care units.[7] It is an important cause of morbidity and mortality among neonates in India with an estimated incidence of approximately 4% in intramural live births.[8] Prompt recognition and appropriate antimicrobial therapy are the key determinants of positive outcome in this serious paediatric emergency.[9]

Microbial invasion of the bloodstream can have serious consequences such as shock, multi-organ failure, disseminated intravascular coagulation (DIC) and death.[10] This study was conducted to know the prevalence of neonatal septicaemia and the antibiotic susceptibility patterns of the bacteria.

METHODS

This retrospective observational study was conducted in the Department of Microbiology after obtaining institutional ethical committee approval. The data was collected from the records of the Department for a period of one year (January 2014- December 2014).

2ml blood drawn under aseptic precautions and inoculated into 20 ml blood culture bottles were received in the Microbiology laboratory along with the details of the neonate.

These blood culture bottles were incubated at 37°C under aerobic conditions in the incubator for 7 days. The first subculture was done after 24 hours of incubation, the second on the third day and a final on the seventh day. Subcultures were done onto blood agar and MacConkey agar plates. The inoculated plates were incubated aerobically at 37°C for 24 hours, and the plates were observed for growth. The growth was identified by colonial characteristics, gram's stain and standard biochemical tests.[11]

Antimicrobial susceptibility testing of all bacterial isolates was performed by the modified Kirby-Bauer disc diffusion method on Mueller-Hinton agar according to the recommendations of the CLSI.[12]

Inclusion criteria

All babies who were either inborn or out born with clinical symptoms and signs of septicemia were included in the study who presented in the duration from January 2014 to December 2014.

Exclusion criteria

All babies with age more than 28 days

Descriptive statistics was used and the results were expressed as percentages.

RESULTS

Among 128 blood samples processed from clinically suspected neonatal septicaemic cases, 45 (35.1%) samples showed growth. Among 45 isolates, 22 were from EOS and 23 were from LOS. Klebsiella pneumonia (9,40.9%) was the major isolate in EOS and Candida (10,43.4%) was the major isolate in LOS.

Table 1: The distribution of pathogens in EOS.

	Males (%)	Females (%)	TOTAL
Klebsiella pneumoniae	5 (55.5)	4 (44.5)	9
Candida	5 (71.4)	2 (28.6)	7
Staphylococcus aureus	2 (66.7)	1 (33.3)	3
Citrobacter	2 (100)	0	2
CONS	0	1 (100)	1
Total	14 (63.6)	8 (36.4)	22

Table 2: The distribution of pathogens in LOS.

	Males (%)	Females (%)	TOTAL
Klebsiella pneumoniae	6 (75)	2 (25)	8
Candida	9 (90)	1 (10)	10
Escherichia coli	2 (100)	0	2
Citrobacter	0	1 (100)	1
Staphylococcus aureus	1 (100)	0	1
CONS	0	1 (100)	1
Total	18 (78.2)	5 (21.8)	23

Table 3: Antibiotic sensitivity pattern of Gram negative bacteria.

	Klebsiella pneumonia N=17	Escherichia coli N=2	Citrobacter N=3
Ampicillin	0	0	0
Ciprofloxacin	6 (35.3)	0	1 (33.3)
Cotrimoxazole	2(11.8)	0	0
Ceftriaxone	10 (58.8)	1 (50)	2 (66.6)
Cefotaxime	9 (53)	1 (50)	2 (66.6)
Cefepime	15 (88.2)	1 (50)	3 (100)
Amikacin	14 (82.3)	2 (100)	3 (100)
Imipenem	16 (94.1)	2 (100)	3 (100)
Gentamicin	9 (53)	0	0
Tetracycline	2 (11.8)	0	0
Piperacillin-tazobactam	16 (94.1)	2 (100)	3 (100)

Table 4: Antibiotic sensitivity pattern of Gram positive bacteria.

	Staphylococcus aureus N=4	CONS N=2
Penicillin	1 (25)	0
Erythromycin	1 (25)	0
Cotrimoxazole	2 (50)	2 (100)
Oxacillin	1 (25)	1 (50)
Tetracycline	2 (50)	1 (50)
Ciprofloxacin	2 (50)	2 (100)
Azithromycin	3 (75)	2 (100)
Linezolid	4 (100)	2 (100)

Among 45 culture positives, 32 (71.1%) were from males and 13(28.9%) were from females, thus showing a male preponderance. The distribution of pathogens in EOS and LOS is shown in Table 1 and 2 respectively. The antibiotic sensitivity pattern of the bacteria is shown in Table 3 and 4.

DISCUSSION

Among 128 blood samples processed from clinically suspected neonatal septicaemic cases, 45 (35.1%) samples showed growth. Thus the culture positivity rate in this study was 35.1%. Culture positivity rate of 32% has been reported by Mondal et al.[13]

However a high culture positivity rate of 56% and 42.2% has been reported by Sharma et al and Sodani et al respectively.[14,15] A low blood culture isolation rate in this study might be due to the possibility of infection with anaerobes. Chow et al reported that 26% of all neonatal septicemia was caused by anaerobes.[16]

In this study, LOS (23,51.1%) was slightly more than EOS (22,48.9%). Studies done by Kayange N et al and Karambin MM et al reported higher rate of late onset septicemia than early onset septicemia.[17,18]

Totally among 45 culture positives, 32 (71.1%) were from males and 13 (28.9%) were from females, thus showing a male preponderance. Aletayeb S et al, Celicia C et al, Rabia S et al and Ahmad A et al have reported higher number of male neonatal septicaemia than female neonatal septicaemia, which correlates with present study.[19-22] The reason for male preponderance is unknown, but this could be due to sex-dependent factors.[19] The synthesis of gamma globulins is probably regulated by X–linked immuno regulatory genes and as males are having one X chromosome, they are more prone for neonatal septicemia than females.[23]

In EOS, Klebsiella pneumonia (9, 40.9%) was the major isolate among which 5 were isolated from males. In LOS, Candida (10, 43.4%) was the predominant isolate among which 9 were isolated from males. Fungaemia due to *Candida specious* is reported commonly and is an increasing problem especially in neonatal intensive care unit.[24]

In the NICU setting, fungal infections, most commonly involving Candida spp., are more frequently associated with late onset sepsis, with an incidence inversely proportional to the estimated gestational age (EGA) and birth weight.[25] The predisposing factors noted in this study were perinatal asphyxia (6,35.3%), hypoglycaemia (5,29.4%), preterm (4,23.5%) and pneumonia (2,11.8%).

There were 2 isolates of Coagulase negative Staphylococcus in this study, both of which were from

females. Favre et al who concluded their study reporting that CoNS bacteremia harbour a significant mortality and a single positive blood culture in the presence of signs of sepsis should be considered as clinically relevant.[26]

The antibiotic sensitivity showed that most of the Gram negative bacteria were highly resistant to the commonly used antibiotics like ampicillin and gentamicin usually employed as the first line of therapy. Similar findings have been reported by Guha et al and Monga et al.[27,28] However, most of the isolates were susceptible to Amikacin and third generation cephalosporins, comparable to the findings from New Delhi and Hubli Gram positive bacteria showed 100% sensitivity to linezolid and Gram negative bacteria showed more than 90% sensitivity to imipenem.[29,30] Jyothi P et al reported highest sensitivity of bacteria to imipenem and linezolid.[31]

Of the two aminoglycosides studied Amikacin scored over Gentamycin in terms of sensitivity for Gram negative organisms. This is in accordance to the study conducted by Kumhar et al.[32] As this was a retrospective study of microbiological records, it was not possible to correlate with neonatal morbidity and mortality and other markers of sepsis.

CONCLUSION

The prevalence of neonatal septicaemia noted in this study was 35.1% and a clear male predominance in the distribution of all organisms was seen. Klebsiella pneumonia and Candida were the major isolates. Development of sepsis in neonates is a medical emergency and generally the clinicians do not wait for microbiology report and start treatment empirically. If local microbiological databases are available with information regarding the commonly isolated organisms and their drug resistance patterns, it can help the clinicians in empirical therapy.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Edwards MS, Baker CJ. Sepsis in the newborn, in Krugman's Infectious Diseases of Children. Gershon AA, Hotez PJ, Katz SL, Eds. Mosby, Philadelphia, Pa, USA, 2004;545.
2. Stoll BJ, Hansen NI, Sánchez PJ, Faix RG, Poindexter BB, Van Meurs KP, et al. Early onset neonatal sepsis: the burden of group B streptococcal and E. coli disease continues. Pediatrics. 2011;127(5):817-26
3. Jumah DS, Hassan MK. Predictor of mortality outcome in neonatal sepsis. Medical Journal of Basrah University. 2007; 25:11-8.
4. Klein JO, Marcy MS. Bacterial Sepsis and Meningitis. Infectious Diseases of the Fetus and the Newborn Infant. Edited by: Remington JS, Klein JO. Philadelphia: WB Saunders Co. 2001;943-98.
5. Plazek MM, Whitelaw A. Early and Late Neonatal Septicaemia. Arch Dis Child. 1983;58:728-31.
6. Shrestha P, Das BK, Bhatta NK, Jha DK, Das B, Setia A, et al. Clinical and bacteriological profiles of blood culture positive sepsis in newborns. J Nepal Paediatr Soc. 2008;27:64-7.
7. Wu JH, Chen CY, Tsao PN, Hsieh WS, Chou HC, Neonatal sepsis: a 6-year analysis in a neonatal care unit in Taiwan. Pediatrics and Neonatology. 2009;50(3):88-95.
8. Desai DKJ, Malek DSS. Neonatal Septicemia: Bacterial isolates and their antibiotics susceptibility patterns. NJIRM. 2010;1(3):12-5.
9. Mane AK, Nagdeo NV, Thombare VR. Study of neonatal septicaemia in a tertiary care hospital in rural Nagpur. Journal of recent advances in applied sciences. 2010;25:19-24.
10. Gotoff SP. Neonatal sepsis and meningitis. In: Nelson Textbook of Paediatrics. 18 ed. Behraman RE, Kleigman RM, Arbin AM. Eds. Philadelphia. WB Saunders Company. 1996;528-37.
11. Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie and McCartney Practical Medical Microbiology. 14th ed. Edinburg: Churchill Livingstone; 1996.
12. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial disk susceptibility tests; Twentieth informational supplement. CLSI document. 2010;30(20):48-51.
13. Mondal GP, Raghavan M, Bhat BV. Neonatal septicemia among inborn and outborn babies in a referral hospital. Indian J Pediatr. 1991; 58:529-33.
14. Sharma PP, Halder D, Dutta AK. Bacteriological profile of neonatal septicemia. Indian Pediatr. 1987;24:1011-7.
15. Sodani S, Mutha A. Study of the Prevalence of Neonatal Septicaemia with Antibiotic Susceptibility in a Large Tertiary Care Hospital. Indian J Microbiol Res. 2015;2(3):177-85.
16. Chow AW, Leake RD, Yarnanchi T. The significance of anaerobes in neonatal bacteremia. Analysis of 23 cases and review of literature. Pediatrics. 1974;54:736-45.
17. Kayange N, Kamugisha E, Mwizamholya DL, Jeremiah S, Mshana SE. Predictors of positive blood culture and deaths among neonates with suspected neonatal sepsis in a tertiary hospital, Mwanza-Tanzania. BMC Pediatrics 2010;10:39.
18. Karambin MM, Zarkesh M. Enterobacter the most common pathogen of neonatal septicemia in Rasht, Iran. Iran J Pediatr. 2011;21(1):83-7.
19. Aletayeb SM, Khosravi AD, Dehdashtian M, Kompani F, Mortazavi SM, Aramesh RM. Identification of bacterial agents and antimicrobial susceptibility of neonatal sepsis: A 54-month study

in a tertiary hospital. African Journal of Microbiology Research. 2011;5(5):528-31.
20. Cecilia CM, Mary AC, Elizabeth EG, Jonathan GL, Joanne JL et al. Etiology of neonatal sepsis in five urban hospitals in the Philippines. PIDSP Journal. 2011;12:75-85.
21. Rabia S, Nusrat K, Shugfta H. Bacteriology and Anti-Microbial Susceptibility of Neonatal Septicemia in NICU, PIMS, Islamabad- A Tertiary Care Hospital of Pakistan. Ann. Pak. Inst. Med. Sci. 2010;6(4):191-5.
22. Ahmad A, Hussain W, Lamichhane A, Muhammad A, Riaz L. Use of antibiotics in Neonatal sepsis at neonatal unit of a tertiary care hospital. Pak Paed J. 2011;35(1):3-7.
23. Khatua SP, Das AK, Chatterjee BD, Khatua S, Ghose B, Saha A. Neonatal septicemia. Indian J Pediatr. 1986;53(4):509-14.
24. Agarwal J, Bansal S, Malik GK, Jain A. Trends in neonatal septicemia : emergence of non-albicans Candida. Indian Pediatrics. 2004;41:712-5
25. Stoll BJ, Hansen N. Infections in VLBW infants: studies from the NICHD Neonatal Research Network. Semin. Perinatol. 2003;27:293-301.
26. Favre B, Hugonnet S, Correa L, Sax H, Rohner P et al. Nosocomial bacteremia: clinical significance of a single blood culture positive for coagulase negative Staphylococci. Infect Control Hosp Epidemiol. 2005;26:697-702.
27. Guha DK, Jaspal D, Krishna Das MS. Outcome of neonatal septicemia: a clinical and bacteriological profile. Indian Paediatrics. 1978;15:423-8.
28. Monga K, Fernandez A, Deodhar L. Changing bacteriological patterns in neonatal septicaemia. Indian Journal of Paediatrics. 1986;53:505-8.
29. Anand NK, Gupta AK, Mohan M, Lamba IMS, Gupta R, Srivastava L. Coagulase negative staphylococcal septicemia in newborns. Paediatric Clinics of America. 1966;13:1131-48.
30. Tallur SS, Kasturi AV, Nadgir SD, Krishna BVS. Clinico bacteriological study of neonatal septicemia in Hubli. Indian Journal of Paediatrics. 2000;67(3):169-74.
31. Jyothi P, Basavaraj MC, Basavaraj PV. Bacteriological profile of neonatal septicemia and antibiotic susceptibility pattern of the isolates, Journal of Natural Science Biology and Medicine. 2013;4:306-9.
32. Kumhar GD, Ramachandran VG, Gupta P. Bacteriological analysis of blood culture isolates from neonates in a tertiary care hospital in India. J Health Popul Nutr. 2002;20(4):343-7.

Cite this article as: Samaga MP. Prevalence of neonatal septicaemia in a tertiary care hospital in Mandya, Karnataka, India. Int J Res Med Sci 2016;4: 2812-6.