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Bacteriological Analysis of Neonatal Sepsis in a Referral Hospital

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Abstract
Introduction: *Neonatal sepsis is one of the leading causes of mortality and significant morbidity among neonates globally. Formulating Neonatal Intensive Care Unit (NICU) antibiotic policy on a timely basis is the need of hour. This study is aimed at identifying the primary pathogens associated with neonatal sepsis and establishing antibiotic policy based on bacteriological profile and their antibiotic sensitivity.*
Methods: *This is a retrospective study done in a tertiary care referral hospital in South India. The study period was from Sept'17 to Feb'18. The Inclusion criteria were to include all blood culture positive samples of neonates admitted in NICU.*
Results: *There were totally 264 positive cultures during the study period. The gram negative flora predominates with 69.7%. Of the gram negative growth klebsiella was the most common pathogen and proteus was the least common pathogen. There was 30.3% of gram positive growth with CONS as predominant pathogen. Other gram positive bacteria were Enterococcus and staphylococcus. On analysis of the antibiotic sensitivity pattern, more than 50% of klebsiella growths were sensitive to amikacin, ciprofloxacin, cefoperazone and piperacillin. The gram negative isolates were resistant to ampicillin, ceftriaxone, cefotaxime and imipenem. The gram positive isolates were more sensitive to ciprofloxacin, linezolid, piperacillin and cefoperazone. The gram positive isolates of CONS and staphylococcus were less sensitive to vancomycin.*
Conclusion: *The present study reinforces the wide diversity of bacterial isolates in neonatal sepsis and reiterates the need for periodic surveillance of microbial flora. The growing resistance to the antibiotics like vancomycin is of serious concern.*
Keywords: *Neonatal sepsis, antibiotic sensitivity, klebsiella.*

Introduction

Neonatal sepsis is one of the leading cause of mortality and significant morbidity among neonates globally[1,2]. Neonatal sepsis is a life threatening clinical syndrome characterised by signs and symptoms of bacteremia occurring in first 28 days of life[3]. Neonatal deaths in India contribute to 25% of global burden and nearly more than half of this are infection-related[4,5]. Incidence of blood culture proven sepsis in India is 8.5/1000 live birth according to the National Neonatal Perinatal Database (2002-2003)[6,7]. Though the IMR has come down to 25.4 per 1000 live births in recent years, still neonatal sepsis remains a preventable cause of mortality. Bacterial pathogens causing sepsis also varies with respect to demographical patterns and time[8]. Causes related to sepsis are myriad and Clinical signs and symptoms are often non-specific[8]. Hence meticulous observation combined with timely and appropriate use of empirical antimicrobials is of utmost importance for improving neonatal outcomes. Further adding to the problem magnitude is the emerging antibiotic

resistance among common pathogens where use of empirical antibiotics is unavoidable. Highly acclaimed antibiotic stewardship program recommended by CDC emphasizes on judicious use of empirical antibiotics for treating neonatal infections based on local bacteriological profile and sensitivity[9,10]. Formulating Neonatal Intensive Care Unit (NICU) antibiotic policy on a timely basis is the need of the hour[5,11]. This study is aimed at identifying the primary pathogens associated with neonatal sepsis and establishing antibiotic policy based on bacteriological profile and their antibiotic sensitivity.

Methodology

This is a retrospective study done in a NICU of Govt Mohan Kumaramangalam Medical College Hospital, Salem, Tamilnadu. The study period was from Sept'17 to Feb'18. The data was collected from the blood culture and antibiotic sensitivity reports of babies admitted with sepsis during the study period. The Inclusion criteria were to include all blood culture positive samples of neonates admitted in NICU and the exclusion criteria was to exclude the blood culture positive samples of infants above 29 days of life. The processing of samples for blood culture and the bacterial identification was done by standard methods. Bacteria were identified by their characteristic pattern, Gram staining and confirmed by standard tests. The antibiotic sensitivity was also determined according to the guidelines of Clinical and Laboratory Standards Institute. The data were recorded and analyzed using Microsoft Office Excel software and the results were explained in frequency and percentage.

Results

There were totally 264 positive cultures during the study period (Figure: 1). The gram negative flora predominates with 69.7%. Of the gram negative growth klebsiella was the most common pathogen and proteus was the least common pathogen. The other gram negative pathogens were pseudomonas and acinetobacter. There was 30.3% of gram positive growth with Coagulase Negative Staphylococci (CONS) as the predominant pathogen. Other gram positive bacteria were Enterococcus and staphylococcus. There was no growth of Group B Streptococcus.

On analysis of the antibiotic sensitivity pattern (Table: 1), more than 50% of klebsiella growths were sensitive to amikacin, ciprofloxacin, cefoperazone and piperacillin. E.coli growths were more sensitive to amikacin, piperacillin and cefoperazone. Pseudomonas growths were more sensitive only to piperacillin. The gram negative isolates were resistant to ampicillin, ceftriaxone, cefotaxime and imipenem. The gram positive isolates were more sensitive to ciprofloxacin, linezolid, piperacillin and cefoperazone. The gram positive isolates of CONS and staphylococcus were less sensitive to vancomycin.

Figure: 1 Bacteriological profile of the study group

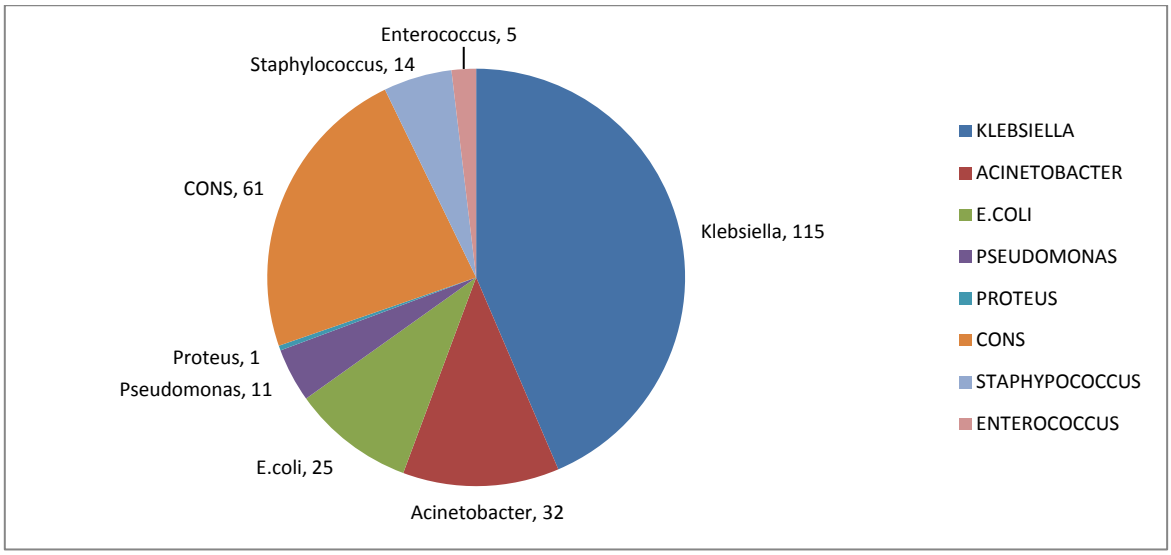

Table: 1 Bacteriological and antibiotic sensitivity pattern

	Klebsiella	Acinetobacter	E.coli	Pseudomonas	Proteus mirabilis	CONS	Staphylococcus	Enterococcus
Ampicillin	52(45.12%)	15(46.87%)	10(40%)	4(36.36%)	1(100%)	8(13.11%)	1(7.14%)	1(20%)
Amikacin	63(54.78%)	23(71.87%)	18(72%)	4(36.36%)	1(100%)	13(21.31%)	2(14.28%)	NT
Ciprofloxacin	67(58.26)	7(21.87%)	11(44%)	NT	NT	22(36.06%)	10(71.42%)	NT
Gentamycin	42(36.52%)	22(68.75%)	12(48%)	NT	1(100%)	10(16.39%)	2(14.28%)	2(40%)
Vancomycin	NT	NT	NT	NT	NT	6(9.83%)	1(7.14%)	3(60%)
Ofloxacin	21(18.26%)	11(34.37%)	NT	NT	NT	7(11.47%)	1(7.14%)	2(40%)
Cefotaxime	29(25.21%)	13(40.62%)	10(40%)	1(1.09%)	1(100%)	15(24.59%)	8(57.14%)	1(20%)
Ceftazidime	7(6.08)	1(3.12%)	NT	1(1.09%)	NT	NT	NT	NT
Linezolid	NT	NT	NT	NT	NT	28(45.90%)	10(71.42%)	3(60%)
Piperacillin	78(67.82)	21(65.62%)	17(68%)	8(72.72%)	NT	26(42.62%)	10(71.42%)	2(40%)
Cefaperazone	60(52.17)	23(71.87%)	15(60%)	4(36.36%)	1(100%)	29(47.54%)	8(57.14%)	1(20%)
Amoxyclav	16(13.91)	NT	NT	1(9.09%)	NT	7(11.47%)	1(7.14%)	NT
Imipenem	19(16.52)	2(6.25%)	NT	NT	NT	NT	NT	NT
Ceftriaxone	7(6.08)	4(12.5%)	NT	1(9.09%)	NT	NT	NT	NT
Total	115	32	25	11	1	61	14	5

NT = Not Tested

Discussion

In the present study, gram negative isolates were more than the gram positive isolates. In developed countries the gram positive isolates predominate over the gram negative isolates. In developing countries like India, many studies have documented the predominance of gram negative isolates[4,12]. In the present study the most common organism isolated was klebsiella. Many studies from India have documented the same [4, 13,14]. But other studies done by Ahmed et al, Agnihotri et al and Bhat et al showed that the predominant pathogens to be E.coli (30%), Staph.aureus (35.3%) and Pseudomonas (33.2%) respectively [15,16,17].

Klebsiella species were sensitive to Amikacin, ciprofloxacin and Piperacillin antibiotics. They were resistant to commonly used antibiotics like ampicillin, cefotaxime, Ceftriaxone and ceftazidime. A similar pattern of resistance was reported by Rahul Kamble from Maharashtra[18]. He also demonstrated Extended Spectrum Beta Lactamase (ESBL) production by klebsiella and E.coli. He also attributed extensive use of antimicrobials in intensive care units for the ESBL production by organisms. A high degree of resistance to routinely used antibiotics was seen in pseudomonas isolates. A similar degree of antibiotic resistance was documented as early as 1991[19]. The pseudomonas species was sensitive only to piperacillin.

The CONS and Staph. aureus isolates were resistant to all antibiotics and were less sensitive to piperacillin, linezolid and cefoperazone antibiotics. In the present study these organisms were also resistant to vancomycin. But this is in variance to many other studies which demonstrated high degree of sensitivity to vancomycin[20,21]. Enterobacteria isolates were more sensitive to vancomycin and linezolid antimicrobials. This was also demonstrated in other studies [20, 21].

Conclusion

Bacteriology of neonatal septicemia is very much diverse and is not constant to place and time. Several studies on neonatal sepsis have documented the wide spread nature of bacteria and its temporal variability. The present study reinforces the wide diversity of bacterial isolates in neonatal sepsis and reiterates the need for periodic surveillance of microbial flora. The growing antibiotic resistance to higher antibiotics like vancomycin is a matter of serious concern. Indiscriminate use of higher antibiotics should be avoided to check the emergence of drug resistance in neonatal sepsis.

Limitations of the Study

Since this is a retrospective study the clinical profile of the neonates were not studied.

References

1. Kaistha N, Mehta M, Singla N, Garg R, Chander J. Neonatal septicemia isolates and resistance patterns in a tertiary care hospital of North India. J Infect Dev Ctries. 2009;4:55–7.

2. Investigators of the Delhi Neonatal Infection Study (DeNIS) collaboration. Characterisation and antimicrobial resistance of sepsis pathogens in neonates born in tertiary care centres in Delhi, India: a cohort study. Lancet Glob Health 2016;4: e752–60.
3. Shah AJ, Mulla SA, Revdiwala SB. Neonatal sepsis: High antibiotic resistance of the bacterial pathogens in a neonatal intensive care unit of a tertiary Care hospital. J Clin Neonatol 2012;1:72-5.
4. MJ Sankar, SB Neogi, J Sharma, M Chauhan , R Srivastava,et al. State of newborn health in India Journal of Perinatology. (2016) 36, S3–S8.
5. Dibyendu Raychaudhuri, Debasis Das, Neonatal Sepsis: Magnitude, Antibiogram And Outcome in A Tertiary Care Hospital of Kolkata. IOSR Journal of Dental and Medical Sciences. Volume 16, Issue 10 Ver. VIII (Oct. 2017), PP 42-49.
6. Report of the National Neonatal Perinatal Database (National Neonatology Forum) 2002-03.
7. 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 (April 2011) 78(4):413–417.
8. Mhada TV, Fredrick F, Matee MI, Massawe A. Neonatal sepsis at Muhimbili National Hospital, Dar es Salaam, Tanz-ania; aetiology, antimicrobial sensitivity pattern and clinical outcome. BMC Public Health. 2012;12:904.
9. Colleen Nash, Elisabeth Simmons, Palak Bhagat, Allison Bartlett. Antimicrobial Stewardship in the NICU: Lessons We've Learned. NEOREVIEWS Vol. 15 No. 4 April 01,2014 pp.e116-e122.
10. Kanokporn Mongkolrattanothai, Steven Chin, Nair Srikumar, Ting-Yi Lin, Jenna Holmen, et al . Antimicrobial Stewardship in the Neonatal Intensive Care Unit (NICU): Building and Sustaining the Effective Collaboration MPH Open Forum Infectious Diseases, Volume 3, Issue suppl 1, 1 December 2016, 1914.
11. Bhat Y, Ramesh, Leslie Edward S Lewis, and Vandana KE. "Bacterial Isolates of Early-Onset Neonatal Sepsis and Their Antibiotic Susceptibility Pattern between 1998 and 2004: An Audit from a Center in India." Italian Journal of Pediatrics 37 (2011): 32. PMC. Web. 10 Apr. 2018.
12. Sundaram V, Kumar P, Dutta S, Mukhopadhay K, Ray P, Gautam V, Narang A. Blood culture confirmed bacterial sepsis in neonates in a North Indian tertiary care center: Changes over the last decade. Jpn. J. Infect. Dis. 2009; 62:46-50.
13. 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.
14. Kumar GD, Ramachandran VG, Gupta P. Bacteriological analysis of blood culture isolates from neonates in a ter-tiary care hospital in India. J Health Popul Nutr 2002; 20(4):343-347.
15. Nalini Agnihotri, Neelam Kaistha and Varsha Gupta, Antimicrobial Susceptibility of Isolates from Neonatal Septicemia, Jpn J. Infect Dis, 2004, Vol.57:273-275.
16. A.S.M. Nawshad Uddin Ahmed, M.A.K. Azad Chowdhury, Mahbul Hoque and Gary L. Darmstadt, Clinical and Bacteriological Profile of Neonatal septicemia in a tertiary level pediatric hospital in Bangladesh , Indian Pediatrics 2002:: 39:1034-1039.
17. Zakariya B P, Bhat V, Harish BN, Arun Babu T and Joseph NM, Neonatal sepsis in a tertiary care hospital in South India: Bacteriological profile and antibiotic sensitivity pattern, Indian J Pediatr. 2011 April;78(4):413-7.
18. Rahul Kamble and Rajesh Ovhal, Bacteriological profile of neonatal septicemia, Int.J.Curr.Microbiol .App.Sci (2015) 4(2): 172-182.

19. Mathur M, Shah H, Dixit K, Khambadkone S, Chakrapni A, Irani S. Bacteriological profile of neonatal septicemic cases (for the year 1990-91) J.Post Grad. Med.1994;40(1):18- 20
20. Poonam Marwah, Deepak Chawla, Jagdish Chander, Vishal Guglani And Ashish Marwah, Bacteriological Profile of Neonatal Sepsis in a Tertiary-care Hospital of Northern India, Indian Paediatrics, vol 52 february 2015, 158-159.
21. Mamatha P Samaga, Keerthi B J, Sini Joseph. Bacteriological study of early onset and late onset neonatal septicaemia in a tertiary care hospital in South India. International Journal of Contemporary Medical Research 2017;4(7):1478-1481.