Int.J.Curr.Microbiol.App.Sci (2019) *8*(8): 2807-2812

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 08 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.808.323

Neonatal Septicemia: Microbiological Profile and Antibiotic Sensitivity Patterns

Astha Gupta[1], Yogendra Singh[1*] and Ramesh Yadav[2]

[1]*Demonstrator Department of Microbiology Government College, Orai Jalaun, India*
[2]*Department of Microbiology Government College, Orai, Jalaun, India*

**Corresponding author*

Keywords

Bacteria, neonatal septicemia, antibiotic, onset septicemia, late-septicemia

Article Info

Accepted:
22 July 2019
Available Online:
10 August 2019

A B S T R A C T

Neonatal sepsis is one of the significant reasons for morbidity and mortality among the neonates in the developing countries. To determine the bacterial isolates and their antibiotic susceptibility pattern. Blood cultures were performed for all clinically suspected neonatal septicemia cases for 1- year. Identification of all pathogenic isolates was done by conventional methods followed by antibiotic sensitivity testing by Kirby bauer disk diffusion method. A total of 225 suspected for neonatal septicemia were included in this study. Among this 78(34.7%) found to be positive, males were 48(61.54%) and females 30(38.46%). Early onset 69(88.46%) followed by late onset 9(11.54%). Among the total isolates gram positive cocci 48(61.53%) followed by Gram negative bacilli were 24(30.67%) and candida 6(7.69%). Among Gram positive cocci isolates vancomycin, Linezolid and teicoplanin was 100% susceptible. The total of gram negative bacilli isolates Imipenem and Meropenem of 100% susceptible.

Introduction

Neonatal sepsis is defined as an invasive bacterial infection which occurs in the first 4 weeks of life.(1)It is of two types, 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)The information about both the common pathogens causing septicemia in neonates and their antimicrobial susceptibility makes easy to select appropriate antimicrobial treatment. Neonates are more prone to infections due to their weak immunity. Moreover, other risk factors, both in the neonates and in the mothers, are responsible for causing susceptibility to infection.(3)The microorganisms most common associated with EOS include Group B *Streptococcus* (GBS), *Escherichia coli*, coagulase negative *Staphylococcus* species (CONS), *Haemophilus influenza* and *Listeria monocytogenes*, and LOS is caused by CONS, *S. aureus*, *E. coli*, *Klebsiella* spp., *Pseudomonas* spp.,

Enterobacter spp., *Candida* spp., GBS, *Serratia* species, *Acinetobacter* spp. and anaerobes. The recent trends show an increase in infections due to CoNS.[4] Reported rates of neonatal septicemia as per admission in the literature range from 6% to 50% with 3-to 20-fold higher rates in developing countries as compared to developed countries.[5] The overall mortalityrate varies between 20% and 80% depending on the risk factors.[6]In addition; there exists wide variation in the bacteriological profile and antibiogram of microorganisms in different NICUs which changes consistently with time. The information regarding this may helps for selection of antibiotic and prevent from irrational use.

Hence, this study was conducted to know causative agents of neonatal and their antibiotic susceptibility patterns.

Materials and Methods

Study settings

This study was conducted in Department of Microbiology, Rama Medical College, Hospital and Research Centre Kanpur, UP.

Study subjects

A total of 225 non –repetitive blood samples were collected from the clinically suspected cases of NICU patient. A detailed clinical history of the patients was collected.

Study period

This study was conducted from 2017 to 2018

Inclusion criteria

Newborn babies who were clinically suspected for sepsis and admitted to NICU were included in this study.

Exclusion criteria

Infants more than 1 month were excluded from the study.

Ethical consideration

Ethical clearance was taken from Institutional ethical committee.

Specimen collection

5 ml of fresh blood were collected under aseptic precautions using a sterile syringe from neonates from clinically suspected neonates in BHI Broth (brain heart infusion broth) (Hi Media, Mumbai, India). Ratio of blood to broth 1:10

Specimen transport

Specimens were transported to the laboratory as soon as possible after collection and incubated as soon as possible at 37°c.

Specimen processing

All blood cultures samples were processed in laboratory using standard procedure by conventional method and incubated for 48 hours and then sub-cultured onto blood agar and Mac-Conkey agar to look for growth. From the obtained growth isolated colonies were identified by standard bacteriological protocol.[7]and antibiotic sensitivity was done by Kirby Bauer's method according to CLSI guidelines[8]and no growth plates were incubated for further 2nd, 4th and 6th day, samples were reported as no growth after 7 days of aerobic incubation.[7]

Results and Discussion

Neonatal sepsis most commonly occurs in prematurely born babies who undergo aggressive therapeutic measures in order to

maintain vital functions. Another group of infants with a high risk are those born from pregnancies complicated with mother-related infections like premature rupture of membrane, low birth weight, congenital anomalies, maternal febrile conditions, mother urinary tract infection, premature rupture of membranes, especially more than 18hrs, before delivery and multiple pregnancies. (9)

In this study 225 blood culture samples were taken among them 78 were culture positive, a high prevalence rate of 78 (34.6%) was seen, which is approximately similar to Arora *et al.,* 33.7% (10) and lower than the other studies done in India, by Khanal *et al.,* 33.9% (11) and Sharma *et al.,* 44% (12).The reason for this could be the less number of sample included in the study, or anaerobic bacteraemia or a false history from patients with use of antibiotics. High prevalence of septicaemia in other studies may be due to low socioeconomic status of their parents, poor hygiene practices, bottle feeding and high incidence of delivery at home (13).

In this study neonatal sepsis was more frequently diagnosed in babies born below the 30th week of gestation and lower birth weight. Similar data were reported in the study of Stoll *et al.,* (14). In this study table number 4 showed that 69 (88.4%) were early onset and 9 (11.5%) were late onset of neonatal septicemia. In other studies of Jyothi *et al.,* 2013 early onset was (74.8%) and late onset was (25.2%) and S Skrajcinovic *et al.,* early onset (48%) and late onset was (52%) which showed more difference between early onset neonatal septicemia and late onset. The variation in early onset and late onset may be due to the study setting, stay of hospital duration, prior use of antibiotics.

Table.1 Distribution of suspected neonatal septicemia

Positive	78	34.7%
Negative	147	65.3%
Total	225	100.0

Table.2 Sexwise distribution suspected case

Male	87	38.66%
Female	138	61.33%
Total	225	100%

Table.3 Sexwise distribution of positive case

Male	30	38.46%
Female	48	61.54%
Total	78	100.00%

Table.4 Distribution of Early onset and late onset

Early onset	69	88.46%
Late onset	9	11.54
Total	78	100.00%

Table.5 Distribution of isolate

Isolates	Positive	Percentage
CoNS	39	50%
Klebsiella pneumoniae	12	15.4%
Pseudomonas aeruginosa	6	7.7%
MSSA	6	7.7%
MRSA	3	3.8%
Acinetobacter species	3	3.8%
E.coli	3	3.8%
Candida krusei	3	3.8%
Candida tropicalis	3	3.8%
Total	78	100%

Table.6 Antibiotic patterns of Gram negative bacilli

Antibiotics	*Klebsiella pneumoniae* (n=12)		*Pseudomonas aeruginosa* (n=6)		*Acinetobacter* spp (n=3)		*E.coli* (n=3)		Total (n=24)	
AMP	5	41.67%	3	50.0%	2	66.67%	1	33.33%	11	45.83%
AK	7	58.33%	4	66.7%	2	66.67%	3	100.00%	16	66.67%
GEN	7	58.33%	4	66.7%	2	66.67%	3	100.00%	16	66.67%
NET	8	66.67%	4	66.7%	2	66.67%	3	100.00%	17	70.83%
CAZ	8	66.67%	3	50.0%	2	66.67%	3	100.00%	16	66.67%
CTX	8	66.67%	3	50.0%	2	66.67%	3	100.00%	16	66.67%
CIP	6	50.00%	2	33.3%	1	33.33%	2	66.67%	11	45.83%
PIT	8	66.67%	6	100.0%	3	100.00%	3	100.00%	20	83.33%
IPM	12	100.00%	6	100.0%	3	100.00%	3	100.00%	24	100.00%
MRP	12	100.00%	6	100.0%	3	100.00%	3	100.00%	24	100.00%
AT	8	66.67%	6	100.0%	3	100.00%	2	66.67%	19	79.17%
AMC	0	0.00%	3	50.0%	3	100.00%	2	66.67%	20	83.33%

Ampicillin (AMP), amikacine (AK), Gentamicin (GEN), Cefotaxime (CTX), Ceftazidime (CAZ), Ciprofloxacin (CIP), Piperacillin-tazobactam (PIT), Imipenem (IMP), Meropenem (MRP), Aztreonam(AT), Amoxyclave (AMC)

Table.7 Antibiotic patterns of Gram positive cocci

Antibiotics	CoNS (n=39)		MSSA (n=6)		MRSA (n=3)		Total (n=48)	
P	30	76.92%	3	42.86%	0	0.0%	33	68.8%
E	35	89.74%	3	42.86%	1	33.3%	39	81.3%
CD	37	94.87%	4	57.14%	2	66.7%	43	89.6%
AK	30	76.92%	3	42.86%	2	66.7%	35	72.9%
CX	39	100%	6	85.71%	0	0.0%	45	93.8%
VA	39	100%	6	85.71%	3	100%	48	100%
LZ	39	100%	6	85.71%	3	100%	48	100%

Penicillin (P), Erythromycin (E), Clindamycin (CD), Amikacin (AK), Cefoxitin (CX), Vancomycin (VA), Linezolid (LZ)

In this study among gram positive pathogen CONS 39(50%) and methicillin sensitive staphylococcus aureus 6(8%), methicillin resistant staphylococcus aureus 3(4%) were most common isolates similar to Vanitha *et al.,* 8.2% (15) Among Gram positive cocci isolates vancomycin, linezolid and teicoplanin was 100% susceptible. In other studies the Candidemia was much higher (20.29%) (16) While in present study 4% of positive blood culture.

From the other studies it was observed that antibiotic resistance among the Gram-positive isolates was highest to penicillin (87%) followed by amoxyclav (66%).Similar reports of high resistance to Ampicillin (71%) were reported by Bhat *et al.,* (17)

All the Gram-positive isolates were sensitive to vancomycin similar to a study by Hoogen *et al.,* (28) In the present study, 4% *S. aureus* isolates were found to be methicillin-resistant, compared to 11.1%reported by Kaistha *et al.,* (19) The total of gram negative bacilli isolates Imipenem and Meropenem of 100% susceptible which is similar to the resistance pattern reported by Bhat *et al.,* (17)

In this study, the common isolate of blood cultures were coagulase-negative *Staphylococcus* species. This could be a skin normal flora due to contaminant. Education, and awareness of health care worker, use of sterile sets for blood cultures sampling and checklists, permanent organization of false positive blood cultures, likewise as regular and routine monthly reports are key factors for success in reducing contamination rates. Among Gram positive cocci isolates vancomycin, Linezolid and teicoplanin was 100% susceptible.

The total of gram negative bacilli isolates Imipenem and Meropenem of 100% susceptible.

References

1. D. E. Premalatha, MallikarjunKoppad, L. H. Halesh, K.C. Siddesh, N. Prakash. The Bacterial Profile and Antibiogram of Neonatal Septicaemia in a Tertiary Care Hospital. International Journal of Recent Trends in Science and Technology, 2014; 10(3): 451-455.
2. S Thakur, K Thakur, ASood, S Chaudhary. Bacteriological profile and antibiotic sensitivity pattern of neonatal septicaemia in a rural tertiary care hospital in North India. Indian Journal of Medical Microbiology. 2016; 34(1):67-71
3. Sindhu Sivanandan, Amuchou S. Soraisham, and Kamala Swarnam. Choice and Duration of Antimicrobial Therapy for Neonatal Sepsis and Meningitis. International Journal of Pediatrics 2011: article ID 712150, 9 pages Division of Neonatology, Department of Pediatrics, and University of Calgary.
4. Hornik CP, Fort P, Clark RH, Watt K, Benjamin DK Jr, Smith PB, *et al.,* Early and late onset sepsis in very low birth weight infants from a large group of neonatal Intensive Care Units. Early Hum Dev 2012;88(2):69-74
5. Gadallah MAH, Fotouh AMA, Habil IS, Imam SS, Wassef G. Surveillance ofhealth care associated infections in a tertiary hospital neonatal intensive care unit in Egypt: 1-year follow-up. Am J Infect Control 2014; 42(12): 7–11.
6. Bolat F, Uslu S, Bolat G, Comert S, Can E, Bulbul A, *et al.,* Healthcare-associated infections in a neonatal intensive care unit in Turkey. Indian Paediatr 2012; 49 (12):951–7.
7. Collee JG, Miles RS, Watt B. Tests for the identification of bacteria. In: Collee JG, Fraser AG, Marmion BP, Simmons A, editors. Mackie and McCartney

Practical Medical Microbiology. 14th ed. Edinburgh: Churchill Livingstone; 1996. p. 131-50
8. CLSI Performance standard for Antimicrobial susptibility testing; twenty fourth informational supplement CLSI document M100-S29. Wayne, PA clinical Laboratory Standard Institute; 2018.
9. Schuchat A, Zywicki SS, Dinsmoor MJ. Risk factors and opportunities for prevention of early-onset neonatal sepsis, a multicenter case-control study. Pediatrics 2000; 105:21-26.
10. Arora U. Devi P. Bacterial profile of blood stream infections and antibiotic resistance pattern of isolates. J K Sci. 2007; 9:186-90.
11. Khanal B. Harish BN, Sethuraman KR, Srinivasan S. Infective endocarditis: Report of prospective study in an Indian Hospital. Trop Doct. 2002; 32:83-85.
12. Sharma PP, Halder D, Dutta AK. Bacteriological profile of neonatal septicemia. IndPediatr. 1987; 24: 1011-17.
13. Komolafe AO, Adegoke AA. Incidence of bacterial Septicaemia in Ile-Ife Metropolis, Nigeria. Malaysian J Microbio. 2008; 4(2): 51–61.
14. Stoll BJ, Hansen N, Fanaroff AA, Wright LL, Carlo WA, Ehrenkranz RA. Late-onset sepsis in very low birth weight neonates. Neonatal research network pediatr. 2002; 110, 285–294.
15. Vanitha RN, Kannan G, Venkata N, Vishwakanth D, Nagesh V, Yogitha M *et al.*, A Retrospective study on blood stream infections and antibiotic susceptibility patterns in a tertiary care teaching hospital. International Journal of Pharmacy and Pharmaceutical Sciences. 2012; 4(1): 543-48.
16. Rao MSS, Surendernath M, Sandeepthi M. Prevalence of neonatal candidemia in a tertiary care institution in Hyderabad, South India. Int J Res Med Sci. 2014; 2: 1016-19.
17. Bhat Y R, Lewis LE, Ke V. Bacterial isolates of early-onset neonatal sepsis and their antibiotic susceptibility pattern between 1998 and 2004: An audit from a center in India. Ital J Pediatr 2011; 11: 37:32.
18. Van den Hoogen A, Gerards LJ, Verboon-Maciolek MA, Fleer A, Krediet TG. Long-term trends in the epidemiology of neonatal sepsis and antibiotic susceptibility of causative agents. Neonatology 2010;97:22-8
19. 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.

How to cite this article:

Astha Gupta, Yogendra Singh and Ramesh Yadav. 2019. Neonatal Septicemia: Microbiological Profile and Antibiotic Sensitivity Patterns. *Int.J.Curr.Microbiol.App.Sci.* 8(08): 2807-2812.
doi: https://doi.org/10.20546/ijcmas.2019.808.323