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Bacteriology of Early Onset Neonatal Septicaemia in a Tertiary Care Hospital

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Abstract: ***Neonatal sepsis is the commonest causes of neonatal mortality in the developing world. Aims & Objective: To determine the bacteriological profile of neonatal septicaemia, their antibacterial susceptibility pattern. Materials &Methods:A total of 486 neonates(< 1week of age) suspected septicemia admitted in NICU enrolled over a period of 10 months.1-2 ml of blood collected in aseptic conditions inoculated immediately into 5 ml of brain heart infusion broth with 0.025% Sodium polyanethol sulfonate as anticoagulant. The broths were subcultured after overnight incubation on chocolate agar, MacConkey agar and 5%sheep blood agar. organisms isolated kept for biochemical tests for confirmation then checked for Antibiotic sensitivity by Kirby-Bauer disk diffusion method. Results: Out of 486 cases studied, growth of bacteria was obtained in 44.03% blood samples. The most frequent offender was Klebsiella spp 25.7%. followed by E. coli 22.4% Enterobacter spp.18.6%, CONS 14.9%, S. aureus 11.2% and other less frequent isolates. Study of maternal risk factors revealed 30.8% of mothers had preterm labor, 22.4% had PROM and 1.4% had intra partum fever. The most frequent neonatal risk factor was low birth weight affecting 64% of the neonates The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent in S. aureus 95.8% and CONS 87.5% than in Enterococcus spp 33.3% . Resistance to amikacin was relatively uncommon in the former two isolates. None of the gram positive isolates were resistant to the glycopeptides - vancomycin and teicoplanin. Most of the gram negative isolates of Enterobacteriaceae family were resistant to ampicillin and amoxicillin***

Keywords: Septicemia, Kirby-Bauer disk diffusion ,Antimicrobial resistance, Enterobacteriaceae, LBW.

1. Introduction

Septicemia continues to be a major cause of mortality and morbidity in neonates around the world.[1] It is responsible for 30- 50% of the total neonatal deaths in developing countries[2,3] Neonates are more vulnerable to infections because of weak immune barrier. Several risk factors have been identified both in the neonates and mothers. Early onset (within first week of life) neonatal sepsis is generally acquired from pathogens of maternal genital tract, whereas late onset sepsis (after first week till 28 days of life) acquired from the community or from hospital.[4] PROM is considered as a major risk factor for sepsis which leads to ascending infection. Other factors are fever and infection of mother during labour, foul smell , meconium stained amniotic fluid, multiple gestations and caesarean section. Neonatal risk factors are prematurity, low birth weight, asphyxia and long stay in neonatal intensive care unit (NICU)[5]. The gold standard for diagnosis of septicemia is the isolation of organisms from the blood culture[6]. Number of organisms is described as causative agents of neonatal septicemia and it has geographical alterations. Moreover, the isolated organisms are often resistant to multiple antimicrobial drugs which make the treatment difficult .Thus, there is the need for bacteriological monitoring in neonatal wards . The present study was undertaken to describe the spectrum of isolates in cases of neonatal septicemia, and their antimicrobial susceptibility pattern, to know the empirical treatment to reduce the morbidity and mortality rates in neonatal septicemia cases.

2. Materials and Methods

This study was done in Narayana Medical College & Hospital from March2014 to December 2014. All neonates of either sex admitted in NICU with suspected clinical sepsis were included in the study. A total of 486 neonates (< 1week of age) were enrolled . All the babies born to mothers with or without risk factors were prospectively enrolled. 1 to 2ml of blood was collected from each patient under proper aseptic precautions and inoculated immediately into 5 mL of brain heart infusion broth with 0.025% Sodium polyanethol sulfonate as anticoagulant (HiMedia Laboratories, Mumbai). A second similar sample was obtained from a different site after few hours to rule out contamination with skin flora. The broths were subcultured after overnight incubation on Blood agar, Mac Conkey agar and Chacolate agar.Growth was identified by colonial characteristics and standard biochemical tests.[7]Antimicrobial susceptibility testing was performed by the Kirby-Bauer disc diffusion method as per the NCCLS recommendations.[8]

3. Results

Out of 486 cases studied, growth of bacteria was obtained in 214 (44.03%) blood samples. Multiple bacterial growth was obtained from 3 samples (1.4%).Total number of bacterial isolates was 217 and Candida spp. was isolated from 16 samples (3.3%). Of the bacterial isolates the most frequent offender was Klebsiella spp(25.7%). followed by E. coli(22.4%) Enterobacter spp.(18.6%), CONS (14.9%), S. aureus (11.2%) and other less frequent isolates(Table 1). Study of maternal risk factors revealed 30.8% of mothers had preterm labor, 22.4% had PROM and 1.4% had intra partum fever. The most frequent neonatal risk factor was low birth weight affecting 64% of the neonates(Table2). The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent in S. aureus(95.8%) and CONS (87.5%) than in Enterococcus spp(33.3%)(Table 3) . Resistance to amikacin was relatively uncommon in the

former two isolates. None of the gram positive isolates were resistant to the vancomycin and teicoplanin. Most of the gram negative isolates of Enterobacteriaceae family were resistant to ampicillin and amoxycillin.Resistance to cefotaxime ranged from 58% to 67.5% and that to ceftazidime ranged from 39.5% to 66% of isolates(Table4). Resistance to amikacin was less frequent than resistance to gentamicin. Enterobacteriawere less frequently resistant to ciprofloxacin.

4. Discussion

Incidence of neonatal septicemia to vary between 36% to 55%.[9-11] In our study, incidence of neonatal septicemia confirmed by culture was 44.03%.The varying microbiological pattern of neonatal septicemia emphasizes the need for having the knowledge about the causative organisms and their antibiotic sensitivity pattern. This is essential because the first antibiotic administered will not wait for the culture results. Emperical therapy is important to reduce morbidity and mortality associated with neonatal sepsis. In western countries, antibiotics of choice are directed towards group B Streptococcus and E. coli. But in tropical areas, early onset neonatal infections may be caused by multi resistant hospital acquired bacteria, which are transmitted during delivery by lack of hygiene. These organisms are usually resistant genera of Enterobacteriaceae family, Pseudomonas spp. And Staphylococcus.[12]In our study, the most frequent isolate was *Klebsiella* (25.7%) and this was in accordance with other Indian studies.[9, 13] The spectrum of bacteria causing neonatal septicemia in our hospital is comparable to that of National Neonatal Perinatal Network Database report. Group B *Streptococcus*, as is evident from the same report, is not common in our country and we also did not isolate group B *Streptococcus* from our cases. An incidence of 14.9% for CONS in the first week of life is also a matter of concern. This bacterium is often regarded as a contaminant, possibly from the skin, but Leon *et al* [14]opined that the presence of this bacterium in the blood can no longer be taken as contamination especially in patients in critical care units. Most of the cases detected by blood culture occurred in the first week of life (71.3%). This calls for close monitoring of the newborns especially those in high risk categories as soon as they are born. Administration of empiric antimicrobial therapy aimed at gram negative bacteria in suspected cases of neonatal septicemia is suggested. The major gram positive isolates *viz. S. aureus* and CONS were frequently found to be penicillin resistant. Resistance percentage to other antimicrobials like erythromycin, gentamicin, tetracycline and ciprofloxacin were above 40%. High frequency of resistance against these β lactam and non β lactam antibiotics have been seen in MRSA and MRCONS.[15] None of our strains showed resistance against vancomycin or teicoplanin and these drugs therefore can be effectively used if methicillin resistance is suspected during treatment.Gram negative isolates of *Enterobacteriaceae* family offered resistance to anti gram negative Penicillins as well as to extended spectrum cephalosporins in quite large numbers, making it clear that the use of these drugs alone may be ineffective. It was however interesting to note that ciprofloxacin resistance was less frequent among these bacteria. This fact was further supported by *in vivo* results of the drug as could be learnt from the clinical side. A study by Khaneja *et al* (1999)[16] also found quinolones to be effective in the treatment of multidrug resistant gram negative infections in patients including premature and extremely low birth weight infants. The high frequency of resistance to β lactam antibiotics can well be due to their indiscriminate use as first line drugs. This can be avoided by using drugs to which most organisms were susceptible. In case of gram negative isolates, which turned out to be the major pathogens, ciprofloxacin and amikacin are good alternatives and they will also provide some economical relief to the patient.

5. Conclusion

To conclude Klebsiella was the most common gram negative pathogen in our study.we highlight the need of the knowledge about resistant patterns of the organisms to give empirical therapy for suspected cases of neonatal sepsis to reduce the morbity and mortality.

References

[1] Guerina NG. In: *Manual of Neonatal Care*, 4th ed.(Eds.) Cloherty JP, Stark AR (Lippincott-Raven,Philadelphia) 1998;271-299.
[2] Bang AT, Bang RA, Bactule SB, Reddy HM, Deshmukh MD.Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999;354:1955-61
[3] Stoll BJ. The global impact of neonatal infection. Clin Perinatol 1997; 24:1-21.
[4] Stoll BJ. Infections of the neonatal infant. In: Behrman RE,Kleigman RM, Jenson HB (eds.) Nelson textbook of pediatrics.17th ed. Philadelphia Saunders 2004;623-40.
[5] Shah GS, Budhathoki S, Das BK, Mandal RN, Risk factors in early neonatal sepsis. Kathmandu University Medical Journal (2006), Vol. 4, No. 2, Issue 14, 187-191
[6] Ahmed AS, Chowdhury MA, Hoque M, Darmstadt GL. Clinical and bacteriological profile of neonatal septicaemia in a tertiary level pediatric hospital in Bangladesh. Indian, Pediatr. 2002; 39:1034-39.
[7] Baron EJ, Finegold SM (Eds). Overview of conventional methods for bacterial identification. Chapter 13, In: *Bailey and Scott's DiagnosticMicrobiology* (Mosby Publishers, St. Louis)1994:167
[8] Performance Standards for antimicrobial susceptibility testing. Eighth Information Supplement 2000. *National Committee for ClinicalLaboratory Standards* (NCCLS). M2A7 Vol. 20,No. 1 and 2, Villanova, Pa.
[9] Das PK, Basu K, Chakraborty P, Bhowmik PK.Clinical and bacteriological profile of neonatal infections in metropolitan city based medical college nursery. *J Ind Med Assoc* 1999;**97**:3-5.
[10] Ako-Nai AK, Adejujgbe EA, Ajayi FM, Onipede AO. The bacteriology of neonatal septicemi in Ile- Ife, Nigeria. *J Trop Paed* 1999;**45**:146-151.
[11] Gaynes RP, Edwards JR, Jarvis WR, Culver DH,Tolson JS, Martona WJ. Nosocomial infections among neonates in high risk nurseries in the United States.

National Nosocomial Infections Surveillance Systems. *Paediatrics* 1996;**98**:357-361.
[12] Begue P. Current orientation of antibiotic treatment in neonatal bacterial infection. Bull Soc Pathol Exot1991;**84**:712-720.
[13] Kapoor H, Sumathi M, Aggarwal P, Jain SD, Kaur J. Spectrum of bacterial isolates in high risk areas of a tertiary care hospital : 3 year study. *Ind J Med Microbiology* 2000;**18**:166-169.
[14] Ponce deLeon S, Wenzel RP. Hospital acquired blood stream infections with *Staphylococcus epidermidis*: Review of 100 cases. *Am J Med* 1984;**77**: 639-644.
[15] Fluit AdC, Jones ME, Schmitz FJ, Acar J, Gupta R,Verkoef J. Antimicrobial susceptibility and frequency of occurrence of clinical blood isolatesin Europe from the SENTRY Antimicrobial Surveillance Programme, 1997 & 1998. Clin Infect Dis 2000; **30**: 454-460.
[16] Khaneja M, Naprawa J, Kumar A, Piecuch S.Successful treatment of late onset infection due to resistant *Klebsiella pneumoniae* in an extremely low birth weight infant using Ciprofloxacin. *J Perinatol* 1999; **19**: 311-314.July 2002 Roy *et al* - Neonatal Septicaemia in Tertiary Care Hospital 159

Tables:

1. Disribution of organisms in samples

Organism	Total number	%
Klebsiella	55	25.7
E.coli	48	22.4
Enterobacter spp	40	18.6
CONS	32	14.9
S.aureus	24	11.2
Citrobacter spp	06	2.8
Pseudomonas spp	04	1.8
Acinetobacter spp	03	1.4
Enterococcus spp	03	1.4

2. Risk factors associated with EONS

Neonatal factors		Maternal factors	
Perinatal asphyxia	67(31.3%)	PROM	48(22.4%)
Prematurity	48(22.4%)	Intra partum fever	03((1.4%)
Low birth weight	137(64%)	Preterm labour	66(30.8%)

3. Resistant pattern of Gram positive isolates

Drug	S.aureus	CONS	Enterococcus
Penicillin	24	28	01
Erythromycin	15	14	01
Cotrimaxazole	13	26	01
Cephalexin	06	04	02
Ciprofloxacin	16	15	01
Ceftriaxone	14	16	00
Gentamycin	10	18	01
Amikacin	02	09	01
Tetracycline	04	16	02
Vancomycin	00	00	00
Teicoplanin	00	00	00

4. Resistant pattern of Gram negative isolates

Drugs	Klebsiella	E.coli	Enterobacter spp	Citrobacter spp	Pseudomonasspp	Acineto bacter spp
Ampicillin	55	48	40	06	04	03
Amoxycillin	55	48	40	06	04	03
Cotrimoxazole	26	23	13	02	02	02
Tetracycline	32	28	30	04	03	03
Gentamycin	18	14	26	03	02	02
Amikacin	08	04	07	01	01	01
Cefotaxime	32	29	27	04	03	02
Ceftazidime	23	19	25	03	02	03
Ciprofloxacin	11	09	12	01	01	01
Amoxyclav	33	29	18	04	03	03
Imepenem	06	02	07	02	01	00

References

[1] Guerina NG. In: *Manual of Neonatal Care*, 4th ed.(Eds.) Cloherty JP, Stark AR (Lippincott-Raven,Philadelphia) 1998;271-299.
[2] Bang AT, Bang RA, Bactule SB, Reddy HM, Deshmukh MD.Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999;354:1955-61
[3] Stoll BJ. The global impact of neonatal infection. Clin Perinatol 1997; 24:1-21.
[4] Stoll BJ. Infections of the neonatal infant. In: Behrman RE,Kleigman RM, Jenson HB (eds.) Nelson textbook of pediatrics.17th ed. Philadelphia Saunders 2004;623-40.
[5] Shah GS, Budhathoki S, Das BK, Mandal RN, Risk factors in early neonatal sepsis. Kathmandu University Medical Journal (2006), Vol. 4, No. 2, Issue 14, 187-191
[6] Ahmed AS, Chowdhury MA, Hoque M, Darmstadt GL. Clinical and bacteriological profile of neonatal septicaemia in a tertiary level pediatric hospital in Bangladesh. Indian Pediatr. 2002; 39:1034-39.
[7] Baron EJ, Finegold SM (Eds). Overview of conventional methods for bacterial identification. Chapter 13, In: *Bailey and Scott's DiagnosticMicrobiology* (Mosby Publishers, St. Louis)1994:167
[8] Performance Standards for antimicrobial susceptibility testing. Eighth Information Supplement 2000. *National Committee for ClinicalLaboratory Standards* (NCCLS). M2A7 Vol. 20,No. 1 and 2, Villanova, Pa.
[9] Das PK, Basu K, Chakraborty P, Bhowmik PK.Clinical and bacteriological profile of neonatal infections in metropolitan city based medical college nursery. *J Ind Med Assoc* 1999;**97**:3-5.

[10] Ako-Nai AK, Adejujgbe EA, Ajayi FM, Onipede AO. The bacteriology of neonatal septicemi in Ile- Ife, Nigeria. *J Trop Paed* 1999;**45**:146-151.
[11] Gaynes RP, Edwards JR, Jarvis WR, Culver DH,Tolson JS, Martona WJ. Nosocomial infections among neonates in high risk nurseries in the United States. National Nosocomial Infections Surveillance Systems. *Paediatrics* 1996;**98**:357-361.
[12] Begue P. Current orientation of antibiotic treatment in neonatal bacterial infection. Bull Soc Pathol Exot1991;**84**:712-720.
[13] Kapoor H, Sumathi M, Aggarwal P, Jain SD, Kaur J. Spectrum of bacterial isolates in high risk areas of a tertiary care hospital : 3 year study. *Ind J Med Microbiology* 2000;**18**:166-169.
[14] Ponce deLeon S, Wenzel RP. Hospital acquired blood stream infections with *Staphylococcus epidermidis*: Review of 100 cases. *Am J Med* 1984;**77**: 639-644.
[15] Fluit AdC, Jones ME, Schmitz FJ, Acar J, Gupta R,Verkoef J. Antimicrobial susceptibility and frequency of occurrence of clinical blood isolatesin Europe from the SENTRY Antimicrobial Surveillance Programme, 1997 & 1998. Clin Infect Dis 2000; **30**: 454-460 .
[16] Khaneja M, Naprawa J, Kumar A, Piecuch S.Successful treatment of late onset infection due to resistant *Klebsiella pneumoniae* in an extremely low birth weight infant using Ciprofloxacin. *J Perinatol* 1999; **19**: 311-314.July 2002 Roy *et al* - Neonatal Septicaemia in Tertiary Care Hospital 159