

Sensitivity Pattern of Micro Organisms of Septicemia in Neonatal Intensive Care Unit of a Tertiary Hospital, Bangladesh

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Abstract

Introduction: Neonatal septicemia is a clinical syndrome of systemic illness accompanied by bacteremia occurring in the first 28 days of life. Micro-organism causing neonatal septicemia varies from country to country and region to region and time to time. In many situations, conventional antibiotics are not sensitive to causative micro-organism. Our aim of the study is to identify causative organism and sensitivity pattern of micro-organism in Neonatal Intensive Care Unit, (NICU).

Methods & Subject: Total 300 patients were enrolled in this study with clinically diagnosed septicemia with prior antibiotic treatment or not. This study was done in NICU of tertiary Hospital, Chittagong Medical College, Bangladesh during the period of January 2013 to July 2014. Blood culture was done in Bact/Alert 3D system.

Result: Out of 300 cases, 204 cases were culture negative and 96 cases (32%) were culture positive. *Klebsiella* is the commonest causative organism 52 (54.17%), followed by *Pseudomonas* 16 (16.67%), *Acinetobacter* 14 (14.58%), *S. aureus* 6 (6.25%), *E. coli* 6 (6.25%), *E. coli* with other *Coli* form 2 (2.08%). In this study, sensitivity of *Klebsiella* was mostly to Ciprofloxacin, Imipenem, Azithromycin, Co-trimoxazole, Piperaciline and Tazobactam. Sensitivity to *Pseudomonas* was mostly to Amikacin, Imipenem, Ciprofloxacin, Azithromycin and Cefoperazone with Sulbactam.. Sensitivity to *Acinetobacter* was mostly to Amikacin, Imipenem, Ciprofloxacin, Netilmicin. Sensitivity to *S. aureus* was mostly to Vancomycine, Amikacin, Imipenem, Meropenem. Sensitivity of *E.coli* was mostly to Amikacin, Ciprofloxacin, Ceftazidin. Most of the culture positive organisms not sensitive to conventional Ampicilin, Gentamycin.

Conclusion: Microorganisms identified causing neonatal septicemias in our region are *Klebsiella*, *Pseudomonas*, *Acinetobacter*, *E. coli* and *Enterobacter*. Antibiotic sensitive to identified microorganism were Amikacin, Ciprofloxacin, Levofloxacin, Imipenem, Meropenem, Vancomycin and Ceftazidim..Conventional Ampicillin sensitivity is not detected and Gentamicin sensitivity is also low.

Keywords: Sensitivity pattern of Micro-organism Neonatal Sepsis.

Introduction

Neonatal septicemia is a clinical syndrome of systemic illness accompanied by bacteremia occurring in the first 28 days of life [1]. Micro-organisms causing neonatal septicemia are a bit different from region to region and also country to country depending upon various factors especially socioeconomic conditions and personal

hygiene with environment. It may occur through transplacental infection or an ascending infection from mother's genitourinary tract and from the infected caregiver or nosocomial infections. The incidence of neonatal sepsis is 5 to 8 per 1000 birth, the highest rates occur in LBW, prenatal asphyxia, maternal infection and babies with congenital abnormalities [2]. In global perspective microorganisms most commonly associated with neonatal sepsis include group B *Streptococci*, coagulase negative *Staphylococci*, *Klebsiella*, *Pseudomonas*, *Enterobacter*, *Candida*, *Streptococcus*,

anaerobes and non type able *H.influnzae*. It is important to note that 20-30% of the survivors of neonatal sepsis may exhibit neurological sequelae [2]. Sepsis related mortality is however largely preventable with rational antimicrobial therapy and aggressive supportive care. In most developing countries, gram negative bacteria remain the major source of infection and gram positive microorganisms have been implicated in developed countries, as the most common cause of neonatal sepsis.

While culture positive neonatal sepsis in the USA is 0.98% but in very low birth weight infants under prolonged intensive care the culture proven sepsis may be as high as 30% [3]. Neonatal sepsis is one of the commonest causes of prenatal mortality in the developing world. Mortality rate of early onset neonatal sepsis is 2 to 40% and late onset neonatal sepsis is 2 to 20%. Definitive diagnosis of neonatal sepsis is based on positive blood or cerebrospinal fluid (CSF) culture, both of which takes at least 24 to 48 hours and is often falsely negative. Due to irrational use of antibiotic, sensitivity pattern of microbes are also changed. In many situations, conventional antibiotics are not sensitive to causative micro-organisms & developed increased drug resistance making treatment extremely difficult. Thus, local epidemiology of neonatal sepsis should be constantly updated to detect changes in the pattern of infective pathogens and their susceptibility to various antibiotics.

Objectives of the study were to identify the causative organisms causing neonatal septicemia and to detect culture-sensitivity of the microorganisms.

Methodology

This is a hospital based prospective case series study which was performed in Neonatal intensive care unit (NICU), Chittagong Medical College Hospital, Bangladesh. Duration of this study was January 2013 to July 2014 and sample size was 300. Inclusion Criteria were Term and preterm babies irrespective of sex and weight, clinically diagnosed neonatal septicemia patient under antibiotic treatment and also without, prior antibiotic therapy included in this study. Exclusion Criteria were severe prenatal asphyxia, neonate with congenital anomalies, extremely low birth weight neonates and respiratory distress syndrome.

A baby with good primitive reflex, activity and breast fed in initial 48 hours of life, who then became sick were considered as neonatal sepsis. Characteristic findings of neonatal sepsis patients were respiratory distress in the form of tachypnoea and or severe chest in drawing, reluctant to feeding, abdominal distension, lethargy, hypothermia, Sclerema, Convulsion.

On the day of admission, from every case 3 ml of blood was collected from peripheral vein with aseptic condition and introduced into aerobic and anaerobic media. The blood culture specimens were sent and processed accordingly in Bact/ Alert 3D system in Microbiology laboratory. Departmental ethical committee gave consent to carry on this study and consent also taken from parents of this study cases.

Results

All the cases were grouped into three: Normal birth weight babies (NBW) (wt>2500g) was 30%, Low birth weight, LBW(1500-2500g) was 48% main bulk of patient in the study cases and very low birth weight babies, VLBW (<1500-1000g) was 22% (Figure 1). In NBW group 57.8% were male and 42.2% were female. In LBW group 53% were male whereas 47% were female. In VLBW group 52.8% were male with 47.2% were female. Male female distribution was statistically insignificant. In NBW group early onset sepsis (EONS) was 42.2% but in late onset sepsis (LONS) was 57.8%. In LBW group EONS was 68.2% but late onset Sepsis 31.8%. In VLBW group, EONS was 86.1% but in LONS were 13.9 (Figure 3)*.

Characteristic clinical findings of neonatal sepsis patients were respiratory distress 70%, reluctant to feeding (52%), Abdominal distension (45%), lethargy (43%), hypothermia (38%), Sclerema (18%), Convulsion (11% (Figure 2)) Early onset sepsis was more common in study population which was statistically significant. Serial C-reactive protein is a highly sensitive marker for neonatal sepsis. In this study 78% of sepsis cases were positive for C - reactive protein but 100% of culture positive cases were positive for C - reactive protein. In this study, 32% cases were culture positive but 68% cases were culture negative which were clinically sepsis, out of 300 cases, culture positive only 96 (32%), where *Klebsiella* (54.17%), *Pseudomonas Aeruginosa* (16.67%), *Acinetobactor* (14.58%), *staphylococcus aureus* (6.25%), *Escherichia coli* (6.25%) with mixed infection *Escherichia coli* with coliform (2.08%) (Figure 4).

Culture sensitivity of *Klebsiella* to ciprofloxacin (78%) Imipenem (65%) Levofloxacin (50%), Meropenem (45%), Cefotaxime (40%), Ceftazidim (38%) (Figure 5). Sensitivity of *Pseudomonas* to (69%), Ceftazidim (50%) and Ciprofloxacin (45%) (Figure 6). It was also observed that sensitivity of *Acinetobactor* to Amikacin (81%) Ciprofloxacin (65%), Imipenem (58%), Meropenem (55%) and Netilmycin (60%) (Figure 7) respectively. Culture sensitivity of *staphylococcus aureus* to Vancomycin (83%), followed by Amikacin 60%, Meropenem (60%), Imipenem (55%), and Gentamicin (48%) (Figure 8). Culture sensitivity of *E.coli* to Amikacin (87%), Ciprofloxacin (75%) and Ceftazidim (55%) (Figure 9).

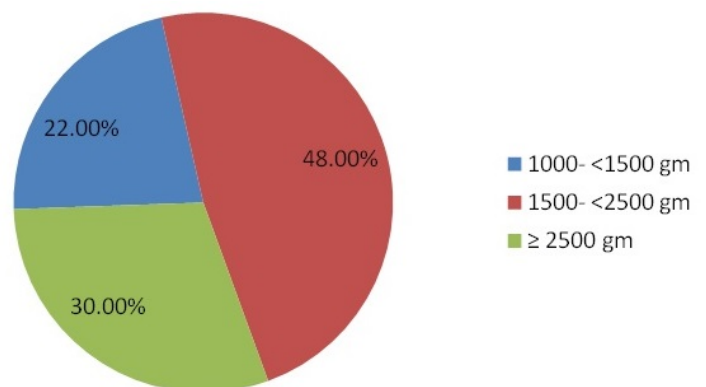


Figure 1: Distribution of birth weight in study cases.

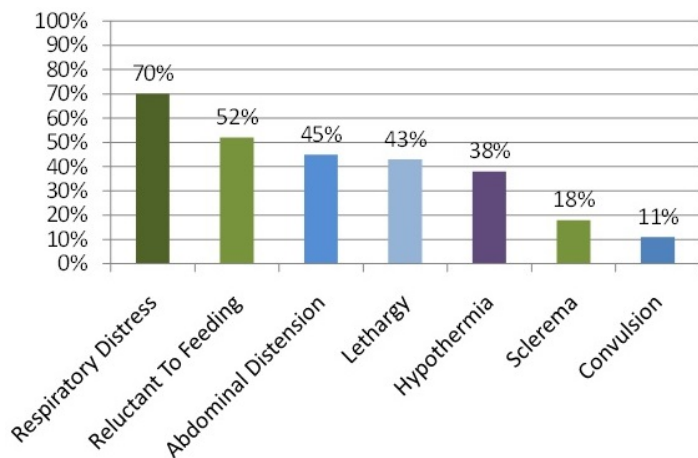


Figure 2: Significant characteristic finding of neonatal septicemia clinically observed.

	>2500g	<2500g	<1500g	
Male	52 (57.8%)	35 (53.0%)	76 (52.8%)	P = 0.735 NS*
Female	38 (42.2%)	31 (47.0%)	68 (47.2%)	
Early onset sepsis (EONS)	38 (42.2%)	45 (68.2%)	124 (86.1%)	P = 0.000 HS*
Late onset sepsis (LONS)	52 (57.8%)	21 (31.8%)	20 (13.9%)	

* Chi-square test significance

Figure 3: Association between sex and sepsis in relation to birth weight.

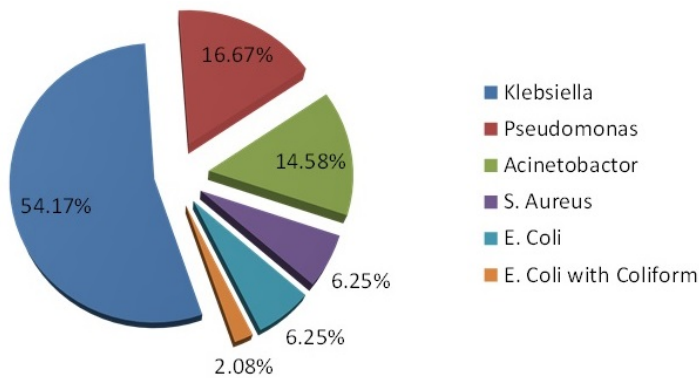


Figure 4: Detected culture positive organisms in study cases.

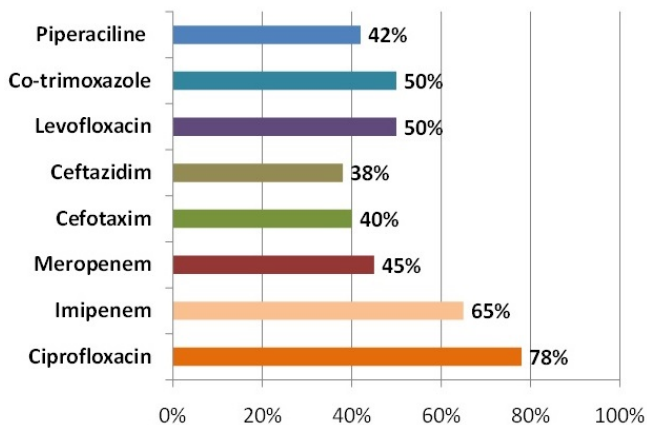


Figure 5: Culture sensitivity of *Klebsiella*.

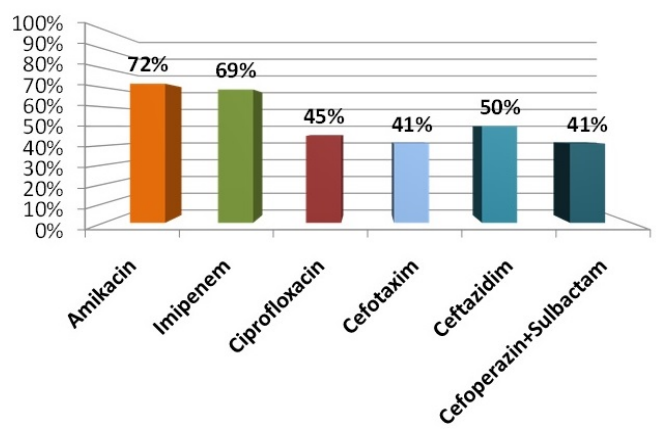


Figure 6: Culture sensitivity of *Pseudomonas*.

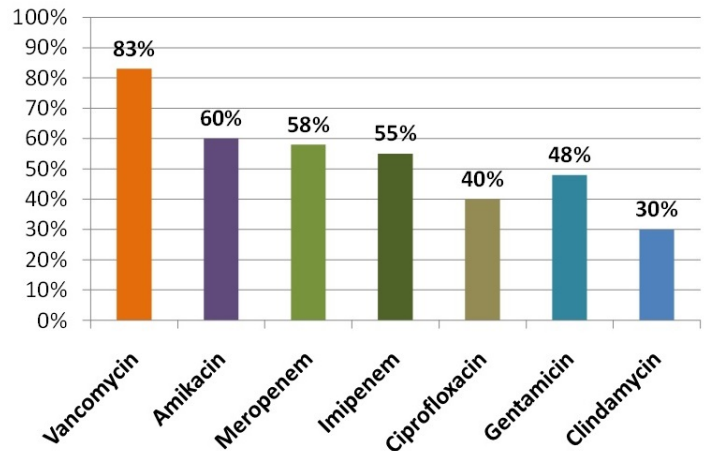


Figure 7: Culture sensitivity of *Staph. Aureus*.

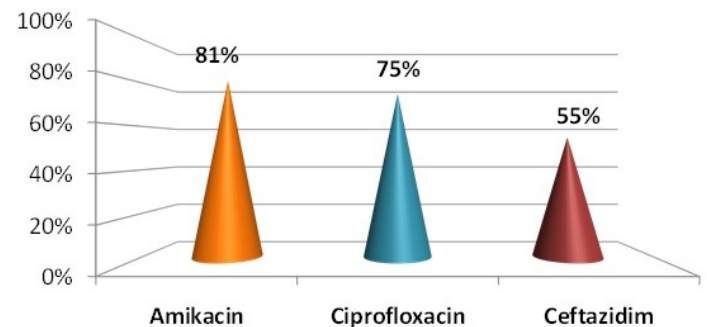


Figure 8: Culture sensitivity of *E. Coli*.

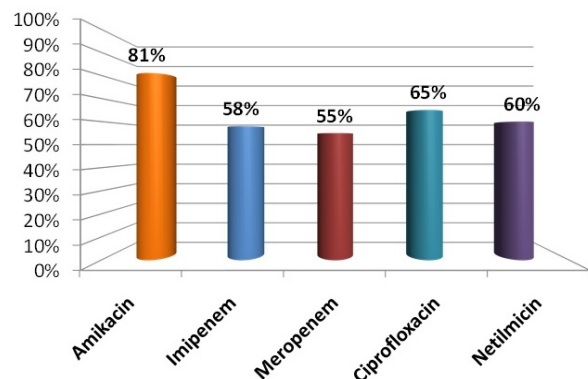


Figure 9: Culture sensitivity of *Acinetobactor*.

Discussion

The cases were grouped into three:- Normal birth weight (NBW) were 30%, 48% were low birth weight (LBW) and 22% were very low birth weight (VLBW) babies. LBW (70%) babies were vulnerable to neonatal sepsis which is similar to other studies. Early onset neonatal sepsis (EONS) were more common than late onset which is consistent with other studies. In this study 78% cases were positive for C-reactive protein but 100% were positive in culture positive cases. Study of west B.A in port Harcourt Nigeria observed that *Klebsiella pneumonia* (50%), *staphylococcus aureus* (21%) were predominant microbes and sensitive to Ciprofloxacin 88.8%, 99.8% respectively but in our study *Klebsiella pneumonia* (54.17%), *pseudomonas aeruginosa* (16.67%) were predominant microbes and *staphylococcus aureus* (6.25%) but *Klebsiella* was mostly sensitive to ciprofloxacin (78%) [4]. In the study of Mehrooty et al, in Turki found that *staphylococcus aureus* (44%), *Klebsiella* (10.5%) were predominant microbes and sensitive to vancomycin and carbapenem, ciprofloxacin respectively [5]. They noticed fungal infection was 19.2% in their study. Sensitivity pattern is also similar to our study but pattern of organisms varies. Shah and Desai observed in their study *E. Coli* with *Klebsiella pneumonia* were predominant organisms caused neonatal sepsis but in our study *Klebsiella* with *pseudomonas* were the predominant organisms and most of the gram negative organisms were sensitive to Amikacin, Imipenem and gram Combined drugs piperacillin and tazobactam [6]. Which were consistent to our study but we observed along with above drugs ciprofloxacin and Levofloxacin were also sensitive. Ramesh and Lincy found in their study 28.8% cases were blood culture positive and common isolated organisms were *Klebsiella* followed by *pseudomonas* and higher resistance to the commonly used 1st line antibiotics Ampicillin and gentamicin [7]. Our study almost consistent to this study, Samia where identified negative organism were the most common pathogens, 80%, were *Klebsiella*, *pseudomonas* (35%), *Enterobacter* (2%) and gram positive organisms were *staphylococcus* 10% and GBS 10%. But in our study, GBS not detected in any blood culture growth [8]. In the study of Viwanathan found in their study gram-negative organisms were the main causes of neonatal sepsis and those organisms were almost 100% resistant to conventional Ampicillin and Gentamicin. Their study finding was similar to our study [9]. In the study of Shari fun and Afroza at Dhaka, Bangladesh observe *Pseudomonas*, *E-coli* and coagulase negative staph common pathogens of neonatal sepsis but in our study *pseudomonas*, *Klebsiella*, *Acinetobacter* *E-coli* were common pathogens but Antibiotic sensitivity almost similar [10]. In the study of Sharma and Agarwal isolated organisms were staph aureus, *Klebsiella*, *E-Coli* and their study also mimic to this study [11]. *Staphylococcus aureus* Agarwal and Bhat observed that 32.72% were blood culture positive and common bacteria isolated were *Klebsiella*, *E-coli* and, *Staphylococcus aureus*. No single group B-streptococcus (GBS) growth found in blood culture [12]. Limitations of this study were small size sample from one NICU & Blood culture done from a number of cases after antibiotic therapy. There was no conflict of interest. We acknowledge Principal, Director of this institute and neonates who gave opportunity to carry out this study.

Conclusion

Microorganisms identified causing neonatal septicemias in our region are *Klebsiella*, *Pseudomonas*, *Acinetobacter*, *E. coli* and *Enterobacter*. Antibiotics sensitive to identified microorganism were Amikacin, Ciprofloxacin, Levofloxacin, Imipenem, Meropenem, Vancomycin, and Ceftazidim. Conventional Ampicillin sensitivity is not detected and Gentamicin sensitivity is also low. Multi centre broad based study for blood culture sensitivity is essential to guide antibiotic regime for neonatal septicemia in developing and developed countries.

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