Frequency of various Bacteria and their Antibiotics Sensitivity in Neonatal Sepsis at Tertiary Care Hospital

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ABSTRACT

Background: Neonatal Sepsis is one of the most common causes of morbidity and mortality particularly in the developing countries, accounting for 30-50 % of the total death each year. The spectrum of the bacteria that varies and antibiotic resistance is an increasing problem of these bacteria.

Objective: To determine the frequency of various bacteria and their antibiotic sensitivity in Neonatal Sepsis at tertiary care Hospital.

Material & Methods: This descriptive Cross-sectional study was conducted in Neonatal ICU, Department of Pediatrics, Saidu Group of Teaching Hospital, Swat, from 1st January 2018 to 30th June 2018. A total number of 350 patients having clinical signs and symptoms of sepsis were enrolled and cultures of blood, urine and CSF were sent to the laboratory with aseptic precautions. Out of these 140 patients with positive cultures were included in the study. The data was collected by random and convenience sampling.

Results: 140 patients were having culture proven neonatal sepsis with culture positivity rate of 40%. Gram Negative Bacteria were the most commonly involved organisms in this study i.e Klebsiella (22.14%) followed by E. Coli (16.42%) and Pseudomonas (12.85%). Staph Aureus (18.57%) was the most common Gram positive isolate followed by Coagulase Negative Strept Cocci (11.42%). Most of the microorganisms isolated were resistant to the commonly used antibiotics like Cefotaxime &Ampicillin.

Conclusions: Neonatal Sepsis is commonly caused by gram negative organisms, which are highly resistant to the commonly used antibiotics including Ampicillin and Cefotaxime. Gram positive organism were observed to have highly sensitive to Vancomycin.

***Keywords*:** Antibiotic Susceptibility, Early Onset Sepsis, Late Onset Sepsis

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INTRODUCTION

Neonatal Sepsis is a clinical syndrome characterized by signs and symptoms suggestive of infection documented by positive blood culture in the first four weeks of life.[1] Neonatal mortality is one of the indicators of measuring of health status of the nation.[2] There could be various reasons of neonatal mortality but Neonatal Sepsis continues to be a major cause of morbidity and mortality worldwide.[3] Incidence varies from country to country but is three time higher in the developing countries. Approximately one million deaths per year occurring in neonatal period (0-28 days) are caused by infection.[4]

Neonatal Sepsis is broadly classified into Early Onset (EONS) and Late Onset Sepsis (LOS). Any neonate who suffers from sepsis in first seven days of life is said to have Early Onset Neonatal sepsis. Some defines Early Onset Neonatal sepsis as the sepsis which occurs within the first 48 hours of birth and is commonly caused by microorganisms acquired from the mother before or during birth. Late Onset Sepsis is defined as when it occurs after seven days of life or more particularly when the infection occurs after 48 hours of life and is caused by the microorganisms acquired from the environment.[5] The frequency of neonatal sepsis in low birth weight and premature neonates is 25% higher compared to those of full term and with normal weight.[6]

The causative organisms of neonatal sepsis are different in different countries, organisms involved in neonatal sepsis in developing countries differ from those found in the developed world. Over all gram negative organisms are more involved in neonatal sepsis in developing countries mainly represented by Klebsiella, E-Coli, Pseudomonas and Salmonella.[7] Gram positive organisms involved in neonatal sepsis include Staph-Aureus, Coagulase Negative Staph- Cocci and Streptococcus Pneumoniae. Group B Streptococcus is equally rare. In developing countries like Pakistan, India, Nigeria and Bangladesh, E-Coli, Klebsiella and Staph-Aureus are the major pathogens involved in EONS.[6,8]

Antibiotic resistance is an emerging issue and most of the isolated organisms having 60-90% resistance to penicillin and ampicillin which are commonly used as first line of treatment option.[9-10] The sensitivity pattern of organisms involved in

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NNS varies greatly from country to country. A study conducted at national level by Jan AZ et al[9] has shown that most of the organisms are resistant to the commonly used drugs. According to the results of sensitivity pattern, 74% organisms showed resistance to Ampicillin and 52% to Cefotaxime Sodium. In another study a prospective review on neonatal sepsis, most of the isolates showed 60-90% resistance to penicillin and ampicillin.[10-11]

The aim of our study was to identify microorganisms causing Neonatal Sepsis and their drugs sensitivity pattern which would help in detecting any change in organism & their sensitivity pattern.

MATERIAL AND METHODS

The study was conducted in the Department of Pediatric Neonatal Care Unit, Saidu Group of Teaching Hospital during 6 months period (from 1st January 2018 to 30th June 2018). Patients with Neonatal Sepsis fulfilling the inclusion criteria of our study were selected from admitted patients. Any baby of age 28 days or less with clinical presentation of bacteremia (like hyperthermia, hypothermia, irritability, lethargy, pallor, skin mottling, reluctance to feed, tachypnea, tachycardia, etc.) with positive blood culture, CSF culture or Urine culture were included in the study. Any neonate with signs and symptoms suggestive of Neonatal Sepsis but has received enteral or parenteral antibiotics in the last 48 hours, and neonates with other serious co-morbid conditions like surgical problems, chromosomal abnormality, dysmorphism or extremely premature babies were excluded from the study.

This was a prospective cross sectional study conducted at Neonatal Intensive Care Unit, Saidu Teaching Hospital Swat. Neonates with signs and symptoms suggestive of neonatal sepsis, from all incoming sources like OPD, Emergency, labor room, referred from private clinics were enrolled. Permission was taken from local Hospital Ethical Committee prior to initiation of study. An informed written consent was also taken from the attendants of the patients. A thorough history and physical examination were performed. Blood was sent to laboratory for culture and sensitivity under aseptic conditions. Blood was placed in Brain Heart Infusion media and was incubated within 30 minutes. Subcultures were plated daily up to Seven days on blood Chocolate Agar and Mc-Conkey Agar. Pure colonies were identified by gram stains and biochemical tests. Sensitivity of the bacterial isolates to different antibiotics was determined using standard Disc Diffusion Method.

The results were presented on graphs and tables.

RESULTS

Among the clinically suspected cases of Neonatal Sepsis, 140 had positive cultures. Early Onset Neonatal Sepsis was present in 86 babies and Late Onset Sepsis was present in 54 babies. Out of 140 babies of culture proven sepsis, 85 were male while 55 were female. The minimum and maximum age at the time of presentation of babies with sepsis was 1 day and 28 days respectively, with a mean age of 7.42 days.

Regarding the gestational age of neonates, 89 were full term and 51 babies were preterm. In this study blood cultures were positive in 83 patients while 57 babies had urine cultures positive, no baby with sepsis had positive CSF culture.

Out of 140 positive cultures, 93 were Gram-negative and 47 were Gram-positive microorganisms as shown Table 1. Among the Gram-negative Klebsiella was the most common pathogen followed by E-Coli and Pseudomonas. Klebsiella was found in 31 (22.14%), E coli in 23 (16.42%) and pseudomonas in 18 (12.85%) patients (Table 2). Amongst the Gram-positive organisms, Staph-Aureus in 26 (18.57%) was the most common bacteria followed by Coagulase-negative staphylococci 16(11.42%) as shown in Table 2.

In Early Onset Neonatal Sepsis, the most common organism isolated was Klebsiella (15%) followed by E-Coli (12.14%) and pseudomonas (4.28%). No Coagulase-negative staphylococci was found in early onset Neonatal Sepsis. In Late Onset Sepsis, S.Aureus (10.71%) was the most common organism followed by Coagulase negative staphylococci (14.28%), pseudomonas (8.57%) and E-Coli (3.57%) as shown in Figure 1.

Regarding antibiotics sensitivity patterns of isolated bacteria, E. coli was mostly sensitive to Ceftazidime, and Amikacin. Similarly, Staph-Aureus was sensitive to Vancomycin, Cefepime and Amikacin. Klebsiella was sensitive to Vancomycin and Amikacin. Pseudomonas was sensitive particularly to Amikacin and ceftazidim. Coagulase-negative staphylococci was sensitive to Cefotaxime and meropenem as shown in Table 3. Most of the bacteria had developed significant resistance to Ampicillin and Cefotaxime.

Table 1: Distribution of bacteria isolated, on the basis of gram staining

Organism	Number(n=140)	Percentage
Gram-Negative	93	66.42%
Gram-Positive	47	33.57%

Figure 1: Distribution of microorganisms according to onset of Neonatal Sepsis

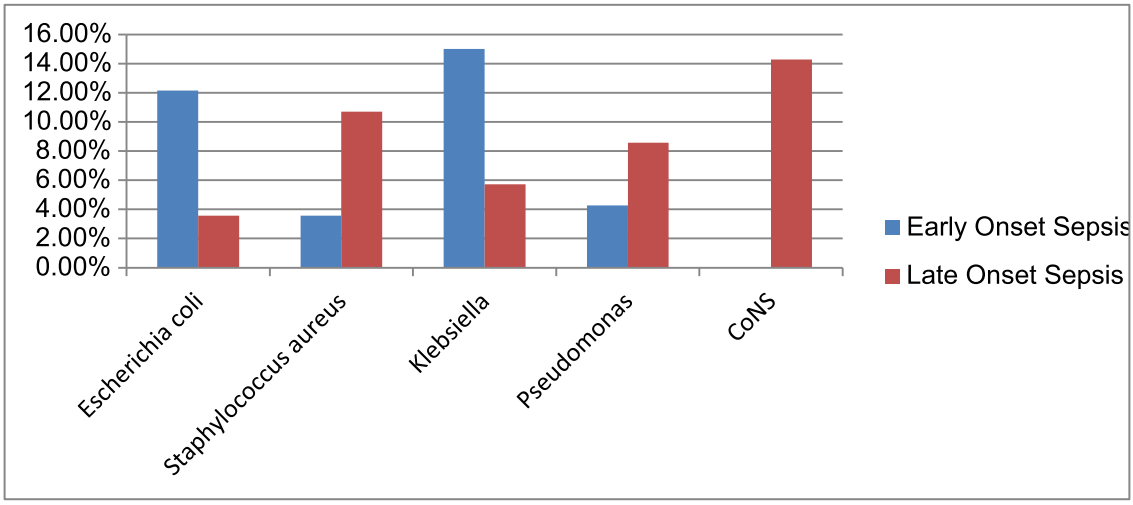


Table 2: Distribution of Microorganisms involved in Neonatal Sepsis

Microorganism	Number of patients (n=140)	Percentage
Klebsiella	31	22.14%
Staph. Aureus	26	18.57%
E-Coli	23	16.42%
Pseudomonas Aeruginosa	18	12.85%
Coagulase Negative Staph.	16	11.42%
Streptococcus Pneumonia	10	7.14%
Enterobacter	10	7.14%
Salmonella	6	4.28%

Tabel 3: Most Common organisms of NNS and their Sensitivity pattern

Microorganism	Most Sensitive Antibiotic	Sensitivity Percentage	Most Resistant Antibiotic	Resistance Percentage
Klebsiella	Amikacin Ceftazidime Vancomycin	93.10% 96.55% 86.4%	Ampicillin Cefotaxime	31.03% 17.24%
Staph.Auerus	Vancomycin Amikacin	100% 71.42%	Ampicillin Cefotaxime	80% 77.14%
E-Coli	Amikacin Meropenem Ceftazidime	95.45% 90.90% 81.80%	Ampicillin Cefotaxime	40.90% 31.81%
CoNS	Vancomycin Meropenem	93.33% 100%	Ceftazidime Ampicillin	66.66% 57%
Pseudomonas	Amikacin Ceftazidime	82.4% 93%	Cefotaxime Cefepime	41.2% 53%

DISCUSSION

In our study 140 cases of culture proven sepsis were identified. Early onset sepsis constituted 66.42%, this high frequency is comparable with many studies conducted earlier.[2,5,7] However, one study showed late onset neonatal sepsis to be more common.[3] This high proportion of early onset neonatal sepsis in our study may be due to minimum facilities for antenatal and natal care in our community. Moreover, education regarding antenatal care and its importance is very low in our society.

In this study, male babies were more often involved in neonatal sepsis than females which is consistent with other studies conducted at national level.[5,7,8] This may be due to the fact male babies are given more care in our society.

Regarding the gestational age, in this study, full-term babies were more commonly having sepsis than the preterm (63.6 vs. 36.4%). This finding is comparable with the studies conducted by Rawat and Neeraj e tal.[12] this contrast of full-term babies being more involved in sepsis than the preterm neonates who are at a greater risk to develop sepsis may be because of the high mortality of preterm babies before arriving to the Hospital.

In our study, gram negatives organisms were more frequently involved in neonatal sepsis 93(66.42%) which is comparable to many other studies conducted in Pakistan and India.[8,13,14] There are, however, very few studies in Pakistan which show Gram Positive organisms to be the main cause of neonatal sepsis.[9]

Among the gram-negative organisms, Klebsiella was the most common organism causing neonatal sepsis in our study. However some workers have found Klebsiella to be the least common pathogen involved in neonatal sepsis.[15] This differences may be due to geographical variation. E-Coli was the second most common organism causing neonatal sepsis.

Among Gram-Positives Staph-Aureus was the most common organism causing Neonatal Sepsis followed by Coagulase negative Staph Cocci. This is comparable to the study conducted at Peshawar by Jan AZ and Gul Zel al.[9]

In our study Pseudomonas was found in 12.85% of the cases of neonatal sepsis. Its incidence reported from other hospital ranges from 8.9% to 13% which are consistent with our study results[16, 17]

Staphylococcus Aureus was the most common organisms isolated among the gram-positive organism in this study & was the second most common over all (17.85%). This is consistent with other research works conducted at national level.[7,9]

In this study no GBS was found causing sepsis. Which is similar to other studies conducted in different parts of Pakistan,[17]

In this study, Escherichia Coli showed a resistance of 31.81% to Cefotaxime sodium. Similarly, Staphylococcus Aureus and Klebsiella showed resistance of 77.14% and 17.24% to Cefotaxime sodium respectively. Previous data from Peshawar and Larkana show similar pattern of high resistance of Escherichia Coli to cefotaxime sodium.[14,15] High degree of resistance to third generation cephalosporin has been reported from India.[11] This is an alarming situation which needs to be addressed.

In this study, Amikacin and Ceftazidime have shown reasonably good sensitivity to both gram negative and gram-positive organisms. Previous data from Lahore, Peshawar and Multan confirm this pattern.[15,18]

In this study, Vancomycin and Meropenem showed good sensitivity patterns to different pathogens with exception of Pseudomonas. 100% of Staph-Aureus and 84.6% of Klebsiella were sensitive to Vancomycin. An another study conducted by Shams R et al at Islamabad shows that 75% of E. coli and 100% of Klebsiella are sensitive to vancomycin.[19]

In this study, Pseudomonas showed a significant resistance to most of the drugs with exception of Amikacin and Ceftazidim to which its sensitivity was 82.4%. 53% pseudomonas isolated was resistant to Cefipime, and 41.2% were resistant to Cefotaxime sodium. In another study from Ghurki Trust Teaching Hospital Lahore, which showed a resistance of 69.3% to Cefotaxime and 47% to Ceftazidime by pseudomonas which is not consistent with our results.[18,20] One of the reasons for this high degree of antibiotic resistance may be excessive ante partum and intrapartum antibiotic exposure.

CONCLUSIONS

Neonatal Sepsis is commonly caused by gram negative organisms, which are highly resistant to the commonly used antibiotics including Ampicillin and Cefotaxime. The gram positive organism are highly sensitive to Vancomycin.

Recommendation: Considering the increased pattern of antibiotic resistance we recommend the rationalized and culture specific use of antibiotics. Vancomycin should be considered as first line drug for neonatal sepsis on empirical basis.

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