

Recent Pattern of Bacterial Isolates and their Antimicrobial Sensitivity in Neonatal Sepsis

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Abstract

Objective:

The objective of this study was to determine the frequency of most common isolated bacterial isolates and their antimicrobial sensitivity pattern in neonatal sepsis.

Material and Methods:

A total of 200 neonates of both genders aged under 28 days of life who presented with neonatal sepsis were included in the study. Blood culture and sensitivity reports were obtained, and frequency of common bacterial isolates and their antibiotic sensitivity pattern were recorded.

Results:

The age of the patients ranged from 2 days to 27 days with a mean of 8.25 ± 5.99 days. Majority (n=172, 86.0%) of the patients were aged under 2 weeks. The weight of the patients ranged from 1.6 Kg to 4.0 Kg with a mean of 2.53 ± 0.56 Kg. Body weight was between 1.6-2.8 Kg in 150 (75.0%) patients while the remaining 50 (25.0%) patients had body weight in the range of 2.9-4.0 Kg. There were 124 (62.0%) male and 76 (38.0%) female patients (with male to female ratio of 1.6:1). *E. Coli* were the most frequent bacteria found in 78 (39.0%) cases while Ciprofloxacin (49.0%) and Meropenem (43.0%) were least resistant antibiotics.

Conclusion:

E coli were the most frequent bacteria followed by *S. aureus*, *Klebsiella spp.*, *Pseudomonas spp.* and *S. epidermidis* in patients with neonatal sepsis. Ampicillin was found to be the most frequent resistant antibiotic and meropenem was least resistant drug.

Key Words: Neonatal Sepsis, Bacterial Isolate, Antibiotic Sensitivity Pattern

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INTRODUCTION

Sepsis in neonates is among major health concerns and contribute in larger number of deaths in neonates. A larger proportion of about 30-50% deaths among neonates is due to sepsis in developing countries (Bang et al., 1999). It is notably predicted that one into five neonates develops sepsis and about 1% among these neonates die due to sepsis related reasons (Khan et al., 2012). Neonatal sepsis is classified in two types: one is early-onset while other one is late onset. In early disease, neonates develop symptoms with in first three days of delivery while in late onset, neonates develop illness and symptoms after three days (Zahoor et al., 2012). Sepsis in Neonates is a important medical condition that is characterized by symptoms and signs of disease with active multiplying bacteria without associated bacteremia in the first thirty days of life (Mushtaq et al., 2013). Various systemic infections of the newborn, such as meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infections are included (Edwin et al., 2010). Importantly, superficial infections such as conjunctivitis and oral thrush are not usually included in neonatal sepsis. In intramural deliveries, most frequently isolated bacteria are *Klebsiella pneumoniae* (32.5%), and then a portion of 13.6% by *Staphylococcus aureus* (13.6%). Among external neonatal deliveries (which is referred from towns/community/other hospices),

the most common organism isolated is *Klebsiella pneumoniae* (27%), and then *Staphylococcus aureus* (15%) and at last *Pseudomonas spp.* (13%) (Verma et al., 2015).

Organisms that are responsible for sepsis in neonates vary within geographical boundaries and at the onset of the disease (Ahmad et al., 2011). In addition, a specific organism or a group of organisms is the primary cause of neonatal sepsis in a specific area in specific period over time (Chacko and Sohi 2005). Gram-negative bacteria are a major source of infection observed in most of the developing countries. whereas, in developed countries gram-positive organisms are suggested as common causes of sepsis in neonates (West and Peterside 2012). In the 1960s, gram-negative organisms were diagnosed as the very common cause of neonatal sepsis in Europe and America. And then Group B Streptococcus in the 1970s, and coagulase negative Staphylococcus in the late 1980s and early 1990s were leading cause in neonatal sepsis (Aurangzeb and Hameed 2003). Gram negative organisms are still the leading cause of neonatal sepsis in most developing countries.

It is, therefore, necessary to continue bacteriological surveillance of septicemia in hospitals and neonatal units so as to identify common pathogens and to determine their antibiotic sensitivity. With the passage

of time, these pathogens have developed antibiotic resistance in last two decades. This is due to unselective intra partum antibiotics consumption, unhygienic condition and poor infection control in maternity and neonatal units (Thaver et al., 2009). In addition to reducing the emergence of multidrug resistant organisms through intensive antibiotic use, the study of bacteriological profiles and antibiotic susceptibility patterns plays an important role in the effective management of neonatal sepsis with appropriate antibiotics that reduce the risk of acute illness and death. Antimicrobial susceptibility patterns vary in different studies even in different studies which were conducted at different times in the same hospital (Kousar et al., 2010; Nehal et al., 2013). In the light of the preview, this study was designed to examine the current pattern of bacterial isolates and their antimicrobial sensitivity in neonatal-sepsis in the region of Sargodha.

MATERIALS & METHODS

Study design:

It was a cross-sectional descriptive study.

Setting:

This research was conducted at Department of Pediatric Medicine, DHQ Teaching Hospital Sargodha.

Duration:

This study was done in six months after the approval of synopsis from 09/12/2016 to 08/06/2017.

Data Collection:

This study involved 200 neonates of both genders aged under 28 days of life who presented with neonatal sepsis. Blood culture and sensitivity analysis was acquired. Outcome variable was frequency of common bacterial isolates and their antibiotic sensitivity pattern. A written informed consent was taken from parents of each patient.

RESULTS

The patients in our study population ranged from 2 days to 27 days with a mean of 8.25 ± 5.99 days. Majority (n=172, 86.0%) of the patients were aged under 2 weeks. Detail is given in table 1. The weight of the patients ranged from 1.6 Kg to 4.0 Kg with a mean of 2.53 ± 0.56 Kg. Body weight was between 1.6-2.8 Kg in 150 (75.0%) patients while the remaining 50 (25.0%) patients had body weight in the range of 2.9-4.0 Kg. There were 124 (62.0%) male and 76 (38.0%) female patients having a male to female ratio of 1.6:1. *E. Coli* was the most frequent bacteria found in 78 (39.0%) cases followed by *S.aureus* (24.0%), *Klebsiella spp.* (19.0%), *Pseudomonas spp.* (12.0%) and *S.epidermidis* (6.0%). Detail is given table 2. Ampicillin was found to be the most frequent sensitive antibiotic on culture and sensitivity analysis. It was observed in 148 (74.0%) patients' ampicillin was

resistant followed by Cefotaxime (62.0%), Amikacin (60.0%), Ciprofloxacin (49.0%) and Meropenem (43.0%). Detail is given in Table 3.

DISCUSSION

Neonatal sepsis remains a major health concern worldwide, despite significant advances in introduction of new antimicrobial agents, advanced measures for early diagnosis & treatment and better sepsis hygiene (El-Jadba et al., 2009). The initial induction of appropriate antibiotic therapy remains important factor in the improvement in outcomes and successful treatment. At the same time, the pattern of functional organisms is constantly evolving and the persistent emergence of resistant bacteria aggravates the problem (Sharma et al., 2013).

Table 1: Baseline Characteristics of Study Sample

Characteristics	Participants n=200
Age (days)	8.25±5.99
2-14 days	172 (86.0%)
15-27days	28 (14.0%)
Male	124 (62.0%)
Female	76 (38.0%)
Weight (Kg)	2.53±0.56
1.6-2.8 Kg	150 (75.0%)
2.9-4.0 Kg	50 (25.0%)

In the current study, a total of two hundred bacterial isolates were

included in the study and most common isolated isolate was *E. Coli* (39%). The results of current study disagree with the study done by Fahmey et al. In their study, they examined 673 newborns and only 138 positive blood cultures (20.5%) confirming neonatal septicemia were reported. Of the recovered isolates, 86.2% were gram-negative pathogen. The most isolated bacteria were *Klebsiella* spp. (42.8%), *E. cloacae* (22.5%), and *E. coli* (13.8%). The most common Gram-positive microbes isolated were *S. aureus* with only 12 isolates (8.7%). All isolates of *Klebsiella* spp. and *Enterobacter* (93%) were resistant to ampicillin. Gram-negative pathogens showed maximum sensitivity to imipenem, cefepime and ciprofloxacin; and Gram-positive isolates showed maximum sensitivity to vancomycin, imipenem, and piperacillin. (Fahmey et al., 2013). Difference in the results might be due to difference in geographical location.

Table 2: Frequency of Bacterial Isolates

Bacterial Isolate	Frequency	(%)
<i>S. aureus</i>	48	24.0
<i>S. epidermidis</i>	12	6.0
<i>E. Coli</i>	78	39.0
<i>Klebsiella</i> spp.	38	19.0
<i>Pseudomonas</i> spp.	24	12
Total	200	100

In the study of West and Peterside, *K. Pneumoniae* (58.2%) was the most common bacterial pathogen isolated, then *S. aureus* (20%), *E. coli* (8.1%) while the lowest organism isolated was *Streptococcus* (0.9%). In their study, the most sensitive antibiotic to isolated organisms were Quinolones. (West and Peterside 2012). The results of this study were in accordance to results of the current study. We also found ciprofloxacin among the least resistant antibiotic.

Table 3: Frequency of various Antibiotic Resistance Pattern

Antibiotic	Resistance Pattern of antibiotics	
	Frequency	(%)
Ampicillin	148	74.0
Amikacin	120	60.0
Cefotaxime	124	62.0
Ciprofloxacin	98	49.0
Meropenem	86	43.0

The result of our study was also in accordance to a study which was done in Pakistani Aurangzeb and Hameed. In their study, they reported that Gram Negative organisms were resistant to commonly used antibiotics including the penicillin group (ampicillin 79% and amoxicillin 75%), cephalosporin group (ceftazidime 72%, cefotaxime 55%) and protein inhibitors (gentamicin 43% and Tobramycin 34%). However, isolated bacteria were least resistant to, imipenem (24%), amikacin (22%) and ciprofloxacin (12%). *S. aureus* showed

resistance to ampicillin, 75%, and relatively less resistance to remaining antimicrobial than the gram-negative organisms. (Aurangzeb and Hameed 2003).

CONCLUSION:

E coli were the most frequent bacteria followed by *S. aureus*, *Klebsiella spp.*, *Pseudomonas spp.* and *S. epidermidis* in patients with neonatal sepsis. Ampicillin was found to be the most frequent resistant antibiotic and meropenem was least resistant drug.

Conflict of interest

All the authors declare that there is no conflict of interest.

Ethical approval

Ethical approval was taken from ethical review committee DHQ Teaching Hospital, Sargodha, Pakistan.

Consent for Publication

All author approved manuscript for publication.

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