

# TRENDS IN PATTERNS OF RESISTANCE AMONG MICRO ORGANISMS CAUSING NEONATAL SEPSIS IN PESHAWAR

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## ABSTRACT

**Objective:** To report the spectrum and patterns of resistance among micro organisms causing neonatal sepsis in a tertiary care neonatal setting.

**Methodology:** This descriptive study was conducted in Special Care Baby Unit (SCBU) Department of Child Health and Microbiology Section Department of Pathology, Khyber Teaching Hospital Peshawar from March 2008 to January 2009. 1000 Blood cultures were taken, using standard methods, from neonates with a clinical diagnosis of sepsis. The cultures were incubated and sensitivity to various antibiotics was tested by standard disc diffusion Technique.

**Result:** The culture positivity rate was 11.1%. *E. coli* was the most common organism found in 44 (39.63%) cases, followed by *Klebsiella* (n= 21 18.91%), *Staph aureus* (n=18, 16.21%), *Staph Epidermises* (n=16, 14.41%), *Pseudomonas* (n=12, 10.81%). None of the cultures was positive for Group B *Streptococcus* (GBS) and *Listeria*. Among the isolates there was low sensitivity (+) to ampicillin, good sensitivity (++) to cefotaxime, ceftriaxone, ceftazidime, and maximum sensitivity (+++) to amikacin, quinolones and imipenem. Majority of the organisms were resistant to commonly used antibiotics.

**Conclusion:** Gram negative organisms remain the major cause of neonatal sepsis in tertiary care units. Majority of these organisms are resistant to commonly used antibiotics.

**Key Words:** Neonatal Sepsis, Bacterial isolates, Sensitivity patterns.

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## INTRODUCTION

Neonatal sepsis is an important cause of morbidity and mortality among the newborn babies in Pakistan<sup>1</sup> and one of the most common causes of admission to the neonatal units<sup>2</sup>. About 30-50% admissions to the Neonatal unit are because of this infection<sup>3</sup>.

Neonatal sepsis is a clinical syndrome characterized by systemic sign of infection accompanied by bacteremia during the first month of life.

The spectrum of organisms that causes neonatal sepsis changes over time and varies from region to region. This is due to the changing pattern of antibiotics use and lifestyle.

Gram negative sepsis remains the major cause of neonatal infection and these organisms have developed resistance to the antibiotics used frequently in the neonatal units. This is due to the indiscriminate and inappropriate use of antibiotics, over the counter sale of antibiotics, no legislation, lack of hygienic practices at the place of delivery, high antepartum and intrapartum antibiotic exposure, uncontrolled consumption of antibiotics by the public and easy access to pharmacy.

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**Table 1: Sensitivity Patterns of the Organism to Various Antibiotics**

S No.	Organism	No	Ampicillin	Cefotaxime	Ceftriaxone	Ceftazidime	Cefipime	Ofloxacin	Ciprofloxacin	Amikacin	Imipenem
1	E.coli	44	3(8.82%)	12(35.29%)	10(29.41%)	11(32.35%)	9(26.47%)	23(67.64%)	24(70.58%)	21(61.76%)	29(85.29%)
2	Klebsiella	21	1(4.76%)	11(52.38%)	9(42.85%)	8(38.09%)	9(42.85%)	20(61.19%)	23(71.42%)	22(61.19%)	26(76.19%)
3	Staph. Aures	18	0(0%)	7(38.08%)	4(22.22%)	6(33.33%)	3(16.66%)	7(38.88%)	10(55.55%)	10(55.55%)	12(66.66%)
4	Stap. Epidermidis	16	2(12.5%)	6(37.5%)	5(31.25%)	6(37.51%)	5(31.25%)	8(50%)	10(62.50%)	12(56.25%)	12(68.75%)
5	Pseudomonas	12	3(25%)	4(33.33%)	3(25%)	8(66.66%)	5(41.66%)	6(50%)	7(58.33%)	5(41.61%)	6(58.33%)

Antibiotic resistance is increasing worldwide and becoming a public health issue. Due to the rise in antibiotic resistance among the pathogens, it is important to have local hospital based knowledge of the organism causing neonatal sepsis and their sensitivity pattern.

## METHODOLOGY

This descriptive study was conducted in Special Care Baby Unit Department of Child Health and Microbiology section Department of Pathology Khyber Teaching Hospital Peshawar which is a 1500 bed teaching hospital acting as a Tertiary Care Centre for the Khyber Pakhtunkhwa province and surrounding tribal areas. The annual number of admissions is about 3200 per year. Sepsis accounts for almost 40% of total admission. All the sick babies with signs of sepsis and significant jaundice were included in the study while dysmorphic babies, babies with Grade III Birth Asphyxia, insignificant jaundice and those who received antibiotic before hospitalization were excluded. Also exclude were the babies whose mother received antibiotic before delivery.

Complete history including obstetric history, maternal risk factors; clinical signs and symptoms on physical examination were recorded on a pre designed profarma. Full blood count, blood glucose, blood urea, and blood cultures were taken in all cases. Cerebrospinal fluid (CSF) examination, culture, and urine culture were sent

in selected cases. 2.5ml blood was taken in 30ml closed circuit blood culture bottle. Cultures were processed by aseptic techniques and were sent to the microbiology section. Antibiotics on empirical grounds were started and then modified accordingly.

The sensitivity was checked for commonly used antibiotic (ampicillin, amikacin, cefotaxime, ceftriaxone, ceftazidime, ofloxacin, ciprofloxacin and imipenem).

## RESULTS

A total of 1000 blood culture were taken, out of which 111 (11.1%) were positive. E. Coli was the most frequent bacterium accounting for 44 cases (39.63%) of all bacteria isolated from blood culture followed by Klebsiella 21 (18.91%), Staph aureus 18 (16.21%), Staph Epidermidis 16 (14.41%), and Pseudomonas 12 (10.81%). We did not have a single blood culture positive for GBS and Listeria. The sensitivity pattern of the organism found to various antibiotics is shown in Table 1.

## DISCUSSION

Infections are a frequent and important cause of neonatal mortality and morbidity. As many as 2% of fetus are infected in utero and up to 10 % of neonates having infection in the first month of life, and is responsible for 1.5 to 2.0 million deaths occurring per year in the

under developed countries of the world<sup>4</sup>. Neonatal sepsis is a life threatening emergency and any delay in the treatment may result in death. Continued surveillance is mandatory to select the empirical therapy to reduce neonatal mortality<sup>5</sup>.

The spectrum of organisms causing neonatal sepsis in our study is similar to that reported from other neonatal unit in developing countries with gram negative organisms being responsible for most cases<sup>6</sup>.

In our study 111 (11.1%) of culture were positive which is very low. Prior use of antibiotics may have lead to it as most of the time, parents did not know about the use of antibiotics .The high proportion of *E. coli* may be due to the fact that the community has scanty facilities for antenatal and natal care and lack of basic health facility such as clean delivery and hand washing. Gram negative organisms have been found to be responsible for about more than 80% of total isolates. This high predominance of gram negative organism is consistent with most of the local data from different parts of country. Similar pattern have been reported from children hospital Lahore<sup>7</sup>. Bhutta and Yusuf reported that *Klebsiella* was the most common cause of neonatal sepsis in Karachi, Pakistan. Joshi et al, from India, reported Gram negative sepsis in 67.2% of their cases<sup>8</sup>. Gram negative bacteria also predominated in a study done by Brekhna Aurangzeb and Abdul Hameed in Peshawar in 2003. The result of this study showed that total 77.1% isolate were Gram negative<sup>9</sup>.

*E.coli*, *Klebsiella* and *pseudomonas* constituted 62% of the total cultures. This percentage is comparable to the pooled analysis of reports in the last 30 years from different sectors in Pakistan. According to this analysis more than 62% cases are due to gram negative pathogens<sup>9, 10</sup>.

Our finding of high percentage of *E. coli* and *Klebsiella* is consistent with results from other studies<sup>11-13</sup>. In the local studies, *E. coli* was responsible for both early and late neonatal Gram negative sepsis.

Ceftazidime showed 66.66% sensitivity to *pseudomonas*. This finding is supported by 30 years data from different centers in Pakistan, presented by Bhutta in 1996<sup>14</sup>. *Pseudomonas*

had 76.6% resistance to ceftazidime in other studies<sup>15,16</sup>.

Generally all of the isolates were having very low sensitivity to ampicillin, moderate sensitivity to cefotaxime, ceftriaxone, ceftazidime, cefipime and most of the organisms were sensitive to quinolones, amikacin, and imipenem. The data of Anwar et al<sup>17</sup> from Karachi showed 80% resistance to ampicillin but only 11–13% resistance to cefotaxime and 0–10% resistance to amikacin. Bhutta et al from Karachi also reported a high degree of resistance to ampicillin and gentamicin among Gram negative organisms<sup>17</sup>. Study done at Peshawar by also reported similar resistance to ampicillin<sup>9</sup>.

Group  $\beta$  streptococcus was not isolated in the overall series. The same has been reported in most of the studies from Pakistan and other developing countries<sup>15</sup>.

Ohlsson et al were the first to report the emergence of group beta streptococcus in Saudia Arabia in the early 1980s<sup>18</sup>.

*Staph Aureus* was the 3<sup>rd</sup> most common organism in our study. Anwar et al found gram positive organisms to be the main cause of neonatal sepsis in a Teaching hospital at Karachi, Pakistan<sup>17</sup>.

*Staph Epidermidis* have been isolated in 16 cases (14.41%) which is much higher than a study conducted at children hospital, Lahore and Gurki Teaching Hospital, Lahore<sup>19</sup>. Initially thought to be contaminant, this organism has now been recognized as a cause of neonatal sepsis<sup>17</sup>.

Regarding antimicrobial sensitivity patterns, our main isolates (*E. coli*, *Klebsiella*, *Staph Aureus*, *Staph Epidermidis* and *pseudomonas*) were having low sensitivity to ampicillin and low sensitivity to cephalosporin<sup>14</sup>. The data of Anwar et al from Karachi shows 80% resistance to ampicillin and 11 – 13 % to cephalosporin. Friedman et al from Toronto isolated ampicillin resistance to *E.coli* In the present study amikacin and quinolones, showed good sensitivity especially for gram negative isolates. Other results also support these finding and suggest amikacin combined with 3<sup>rd</sup> generation cephalosporin as empirical therapy for neonatal sepsis<sup>20</sup>.

The antimicrobial agent with a maximum sensitivity for all isolates was imipenem. The use of imipenem is recommended in life threatening condition in neonates.

Antibiotic resistance is increasing worldwide and has become a serious health problem in hospital and community. Infection with resistant organisms has been associated with treatment failure, higher morbidity, and mortality and increase costs. This has necessitated the development, implementation and evaluation of policies on the use of antibiotic. Continuous surveillance is mandatory.

## CONCLUSION

Gram negative organisms, particularly E.Coli and Klebsella, remain the most common organisms of neonatal sepsis and are highly resistant to commonly used antibiotics.

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None Declared

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**CONTRIBUTORS**

QAK conceived the idea and planned the study. HI & HR did the data collection and analyzed the study. All the authors contributed significantly to the research that resulted in the submitted manuscript.