

MEROPENEM SENSITIVITY PATTERN OF BACTERIAL ISOLATES CAUSING NEONATAL SEPSIS IN SPECIAL CARE NEONATAL UNIT OF CHATTOGRAM MEDICAL COLLEGE HOSPITAL

Syeda Shahnoor Hasina Mamtaz^{1*} Abu Hena Md. Saiful Karim Chowdhury²

Abstract

Background: Neonatal sepsis is recognized as an important public health problem with a high morbidity and mortality, mostly occurring in developing countries. Treatment of neonatal sepsis has become a challenge with the emergence of carbapenemase producing bacteria. The study was done to evaluate the sensitivity pattern of bacterial isolates against meropenem causing neonatal sepsis. **Materials and methods:** A total of 100 clinically suspected neonatal sepsis cases was enrolled in the study. Bacteriological profile and meropenem sensitivity pattern was done. **Results:** Among the 100 suspected neonatal sepsis cases, 28% were culture positive and 72% were culture negative. Klebsiella species was the predominant isolated bacteria. Searching meropenem sensitivity pattern, 42.31% bacterial isolates were found to be sensitive and 57.69% were resistant to meropenem. Klebsiella spp. showed 40.00% sensitive to meropenem, whereas Acinetobacter spp. 25.00%, E. coli 66.67%, Staph. aureus 50.00% & Pseudomonas spp. 50.00% sensitive. **Conclusion:** Meropenem is the drug of choice for serious infections but bacterial resistance against it is increasing day by day.

Key words : Meropenem; High morbidity and mortality; Neonatal sepsis.

Introduction

Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteremia in the first month of life¹. Neonatal infections are unique in several ways; infectious agent can be transmitted

1. Assistant Professor of Pediatrics
Bangabandhu Memorial Hospital (BBMH)
Institute of Applied Health Science (IAHS) Chattogram.
2. Lecturer of Microbiology
Chattogram Medical College, Chattogram.

***Correspondence:** Dr. Syeda Shahnoor Hasina Mamtaz
E-mail: shahnoormamtaz@gmail.com
Cell : 01819609568

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from mother to fetus and newborn infant by diverse mode. Incidence of neonatal bacterial sepsis varies from 1-4 per 1000 live birth in developed countries, with considerable fluctuation over time and with geographic variations².

Around one million deaths every year throughout the world are due to neonatal sepsis³. In Bangladesh, currently, the neonatal mortality rate is 18.4 per 1000 live births which accounts for 60% of under five deaths⁴. Neonatal sepsis accounted 40.7% of total admitted cases and attributed about 19.0% of total neonatal death in Special Care Neonatal Unit of Chattogram Medical College Hospital⁵. Micro-organisms implicated in neonatal sepsis have developed increased drug resistance to commonly used antibiotics and thus making treatment extremely difficult. Prevalence of bacterial agent and their sensitivity pattern in an area provide guidance to start empirical treatment which is the cornerstone in the management of sepsis. Local epidemiology of neonatal sepsis should be constantly updated to detect changes in the pattern of pathogens and their susceptibility to various antibiotics⁶. Carbapenems (Imipenem, meropenem, ertapenem, and doripenem) are the latest developed β -lactam antibiotics that possess exceptionally broad spectrum of activity against gram-positive and gram negative bacteria. These agents are primarily used in hospitals as an empiric therapy for the treatment of life threatening infections. Carbapenems are often one of the few therapeutic options available for the treatment of multi-drug resistant bacterial infections. Nevertheless, in the recent past, reports were accumulating on the emergence of carbapenem (Meropenem) resistance all over the world limiting its usage⁷.

Materials and methods

This hospital based observational study was carried out in Special Care Neonatal Unit (SCANU) of Chattogram Medical College Hospital during the period of January-December, 2015.

Inclusion criteria:

- Any neonate having clinical signs/symptoms of sepsis according to Integrated Management of Childhood Illness (IMCI) and World Health Organisation (WHO).

Exclusion criteria:

- Neonates having extreme prematurity (Less than 30 weeks of gestational age)
- Birth weight less than 1000 gm
- Gross congenital anomalies.

Laboratory procedure

Blood samples were taken from 100 suspected neonatal sepsis cases after taking both written and verbal consents from the attendants of the patients. Under all aseptic precautions, at least 3 ml of blood from each neonate was collected. Blood was introduced in the blood culture bottle containing 10 ml of trypticase soy broth. The blood culture bottles were then transported immediately to the laboratory of the Department of Microbiology, Chattogram Medical College for culture and antibiotic sensitivity testing⁸⁻⁹.

Results

Among the 100 suspected neonatal sepsis cases, 28% were culture positive and 72% were culture negative.

Table 1 shows distribution of isolates among the culture proven sepsis showed *Klebsiella* spp. (53.58%) as predominant isolated organisms in the study, followed by *Acinetobacter* spp. (14.28%) *E. coli* (10.72%) *Pseudomonas* spp. (7.14%) *Staph. aureus* (7.14%) & *Candida* spp. (7.14%) respectively.

Table II shows sensitivity pattern of different bacterial isolates against meropenem. Out of 26 bacterial isolates only 11(42.31%) were found to be sensitive and *Klebsiella* spp. showed 06(40.00%) sensitive to meropenem, whereas *Acinetobacter* spp. 01(25.00%) *E. coli* 02(66.67%) *Staph. aureus* 01(50.00%) & *Pseudomonas* spp. 01(50.00%) showed sensitive.

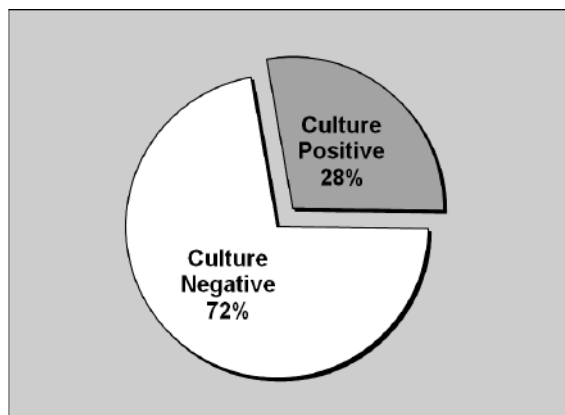


Fig 1 : Distribution of the culture proven sepsis

Table 1: Distribution of causative organisms of neonatal sepsis

Name of organisms	Number	Percentage (%)
<i>Klebsiella</i> spp.	15	53.58
<i>Acinetobacter</i> spp.	04	14.28
<i>E. coli</i>	03	10.72
<i>S. aureus</i>	02	07.14
<i>Pseudomonas</i> spp.	02	07.14
<i>Candida</i> spp.	02	07.14
Total	28	100.0

Table II : Sensitivity pattern of strains against meropenem (n=26)

Name of the bacterial isolates	Number	Number of sensitive strains	Number of resistance strains
<i>Klebsiella</i> species	15	06(40.00)	09(60.00)
<i>Acinetobacter</i> species	04	01(25.00)	03(75.00)
<i>E. coli</i>	03	02(66.67)	01(33.33)
<i>Stph. aureus</i>	02	01(50.00)	01(50.00)
<i>Pseudomonas</i> species	02	01(50.00)	01(50.00)
Total	26	11(42.31)	15(57.69)

● Figures within parentheses indicate percentages

Discussion

Neonatal sepsis is one of the major health problems in developing countries including Bangladesh. Early diagnosis of neonatal sepsis is primarily based on clinical evaluation but it requires clinico-pathological & microbiological correlation¹⁰. In our study, among the 100 suspected neonatal sepsis cases, culture proven sepsis was 28% and culture negative sepsis was 72%. Similar to our study, Barua et al showed blood culture positivity to be 32% in their study done in the same institute¹¹.

A number of organisms is associated with neonatal sepsis and bacterial pathogens may vary from one country to another and within a country from one hospital or region to another. These organisms may even vary at different times within the same place.

Among the isolates from blood culture, *Klebsiella* spp. (53.58%) was the predominant isolated organism in our study followed by *Acinetobacter* spp. (14.28%), *E. coli*(10.72%) *Pseudomonas* spp., *Staph. aureus* & *Candida* was 7.14% each. Similar to our study, Tasneem also found *Klebsiella* spp. (24.4%) as predominant isolates followed by *Salmonella*, *Serratia*, *Acinetobacter* spp.

& *E. coli*¹². Begum et al. found similar finding with *Klebsiella* spp. predominance in their study¹³. Our findings were also in concordance with the results of Barua et al where *Klebsiella* spp was 54.17% followed by *Pseudomonas* spp. (16.67%) *Acinetobacter* spp. (14.58%) *S. aureus* & *E. coli*¹¹. The high occurrence of *Klebsiella* spp. in neonatal sepsis is of great concern and resistance of this organism may be due to the presence of capsule that gives some level of protection to the cells, presence of multidrug resistance efflux pump, easy spreading nature, pathogenic & efficient at acquiring and disseminating resistance plasmid^{14,15}.

Of all available anti-microbial agents, carbapenems are the most sensitive and reliable treatment options for bacterial infections. The emergence of resistance to carbapenem (Meropenem) is an important growing threat to public health, since it is the final therapeutic option currently available for the treatment of life threatening infections.

Searching meropenem sensitivity pattern, we found that out of 26 bacterial isolates only 11(42.31%) were found to be sensitive and rest 15(57.69%) were resistant. Among the *Klebsiella* spp. 40% showed sensitive to meropenem whereas 60% were resistant. *Acinetobacter* spp. showed 25 %, *E. coli* 66.67%, *Staph. aureus* and *Pseudomonas* spp. both were 50% sensitive to meropenem. Another study done in the same institute showed that *Staph. aureus* was 60% sensitive to meropenem followed by *Acinetobacter* spp. 55% & *Klebsiella* spp. 45% respectively¹⁶. Other study done in Bangabandhu Sheikh Mujib Medical University, Dhaka showed *Staph. aureus* was 100% sensitive to meropenem followed by *Klebsiella* spp. 91.20%, *Pseudomonas* spp. 80% & *Acinetobacter* spp. 57.1%¹⁷. This variation on sensitivity pattern might be due to the number of isolates studied, variation in different institutes and also geographic locations.

Conclusion

Carbapenem (Meropenem) resistance of the causative organisms of neonatal sepsis is a rapidly emerging & potentially disastrous problem worldwide, has become a serious health problem in hospitals and the community. In fact, the situation is worst in developing countries because of the lack of control of the use of the antibiotics, the non-existence of legislation on antibiotic prescription. However, we need to keep in mind that the carbapenem (Meropenem) must be kept in reserve for life-threatening infections.

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Contribution of authors

SSHM : Conception, initial design, acquisition of data, interpretation of data, manuscript writing and final approval.

AHMSKC : Acquisition of data, data analysis, critical revision of the version and final approval.

Disclosure

Both the authors declared no competing interest.

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