

## Prescription pattern of antibiotics in neonatal intensive care unit of tertiary care hospital

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### ABSTRACT

**Background:** Recurrent and prolonged courses of antibiotics exposure have resulted in an increase in the prevalence of hospital acquired infections and antibiotic resistant profile. The objective of this study was to quantify the use of antibiotics in a neonatal intensive care unit (NICU) of Govt. Medical College and Hospital, Aurangabad, Maharashtra, a tertiary health care centre.

**Methods:** A total of 260 neonates admitted in NICU from August 2017 to February 2018 were enrolled in the study and fulfilling inclusion criteria of the study. Demographic details, data on antibiotic prescriptions (name, dose, frequency, route of administration) was recorded on pre-tested structured Performa.

**Results:** A total of 248 neonates received the antibiotics. EOS pneumonia was most common i.e. 29.8% followed by LOS pneumonia (20.6%). Sepsis, pneumonia Meningitis, NEC, were common indications for admission in NICU. Among the antibiotic combinations amoxicillin + clavulanate (38.99%), was most commonly prescribed followed by gentamicin (37.89%) and piperacillin (11.01%) respectively. Other antibiotics like, linezolid (0.94%), fluconazole (5.97%), meropenem (4.42%), vancomycin (0.77%) were also used less commonly in NICU. About fifty of the medicine prescribed were in compliance with the national list of essential medicines 2011.

**Conclusions:** In tertiary care setup of NICU amoxicillin + clavulanate and gentamicin are most commonly used antibiotics in NICU. The study concludes that the antibiotic prescription pattern at NICU of our tertiary care hospital was found rational.

**Keywords:** Antibiotics, Drug utilization, Neonates, NICU

### INTRODUCTION

Worldwide population consists of about 28% children and infants who are most susceptible to infective diseases due to under developed immune system.<sup>1</sup> Several studies have reported that 50%-85% of children receive antibiotics prescribed.<sup>2</sup> Neonates are among the most vulnerable population groups to contract infections.<sup>3</sup> Due to differences in pharmacodynamic and pharmacokinetic characteristics, neonates are prone to harmful effects of drugs.<sup>4</sup>

Neonates, mainly premature, are at high risk of bacterial infections than term neonates. This is because their physiological functions are immature leading to high morbidity and mortality.<sup>5</sup> Major neonatal mortality and

morbidity worldwide is due to septicemia comprising various systemic infections of the newborn such as septic shock, meningitis, pneumonia, arthritis, osteomyelitis, and urinary tract infections.<sup>6</sup> Empirical antibiotic therapy needs to be given immediately on suspicion of septicemia followed by cultures and sensitivity, later based on report reevaluation of antibiotic treatment provided can be done.<sup>7</sup>

Prescriptions and drug utilization monitoring can identify the problems and provide feedback to physicians so as to create awareness about irrational use of drugs.<sup>8</sup>

Judicious use of antibiotic is very important way to reduce the problem of antimicrobial resistance. Neonates require more attention while prescribing antibiotics in order to

avoid the, adverse drug reactions, drug resistance and drug-drug interactions.<sup>9</sup>

Thus, the aim of our study is to observe and analyze the prescribing pattern of antibiotics use in NICU at tertiary care Govt. Medical College and Hospital, Aurangabad, Maharashtra.

## METHODS

Present study was carried out at NICU of Govt. Medical College, Aurangabad, Maharashtra, in collaboration with department of pharmacology. The study was approved by institutional ethics committee.

### Study design

Prospective, observational, open Label, descriptive clinical Study.

### Sample size

Data was collected from August 2017 to February 2018. n=260 neonates were admitted in NICU. n=248 patients were enrolled.

### Inclusion criteria

- Patients admitted in NICU of tertiary care center and receiving antibiotics.
- Patients willing to give informed consent.

### Exclusion criteria

- Not ready to give informed consent.
- Not ready to give follow up is asked for.
- Incomplete data entry in case record forms.

### Procedure

- Indoor case record forms for prescription and antimicrobial sensitivity reports of NICU was collected.
- Data was collected from August 2017 to February 2018.
- Probable diagnosis and antibiotics prescribed to patients was recorded.
- Data was analyzed using MS Excel and SPSS v20.

## RESULTS

A total number of n=248 neonates receiving antibiotics were included in present study. They were divided into 2 major groups i.e. Early onset sepsis (EOS) and late onset sepsis (LOS) according to diagnosis.

They were further subdivided into specific diagnosis groups. As shown in Table 1, EOS pneumonia was most common i.e. 29.8% followed by LOS pneumonia (20.6%).

sepsis, pneumonia meningitis, NEC, were common indications for admission in NICU.

**Table 1: Distribution of neonates according to probable diagnosis.**

Diagnosis	Frequency	Percent (%)	Cumulative Percent (%)
EOS pneumonia	74	29.84	29.84
LOS pneumonia	51	20.56	50.4
EOS PROM	40	16.13	66.53
EOS meningitis	15	6.05	72.58
LOS NEC	15	6.05	78.63
LOS BC +ve	13	5.24	83.87
LOS CRP+ve	13	5.24	89.11
EOS CRP +ve	7	2.82	91.93
LOS meningitis	7	2.82	94.75
LOS PROM	7	2.82	97.57
EOS BC +ve	5	2.02	99.59
EOS NEC	1	0.40	100
Total	248	100.0	

EOS: Early onset sepsis; LOS: Late onset sepsis; BC: Bacterial culture; CRP: C Reactive protein; NEC : Necrotizing enterocolitis PROM : Premature rupture of membrane

**Table 2: Prescription pattern of antibiotics in NICU.**

Antibiotics	No. of prescriptions (n=636)	Percentage (%)
Amoxicillin + clavulanate	248	38.99
Gentamycin	241	37.89
Piperacillin	70	11.01
Fluconazole	38	5.97
Meropenem	28	4.42
Linezolid	06	0.94
Vancomycin	05	0.77
Total	636	100

Note: multiple drug combinations were given to patients.

As EOS pneumonia was the most common cause for admission in NICU. Amoxicillin + clavulanate (38.99%) was the most common antibiotic given to neonates for treatment followed by Gentamycin (37.89%) as shown in Table 2.

Out of 248 neonates 62 neonates (25%) received amoxicillin + clavulanate for 7 days and,104 neonates (41.93%) received for 14 days and 82 neonates (33.06%) received for 21 days.

Out of 248 neonates 59 neonates (24.48%) received gentamicin for 7 days and 101 neonates (41.91%) received

for 14 days and 81 neonates (33.61%) received for 21 days as shown in Table 3.

**Table 3: Antibiotics class usage pattern.**

Antibiotic prescribed	No. of days of antibiotics given	No. of neonates receiving antibiotics	Percentage (%)
Amoxicillin + clavulanate	07	62	25.00
	14	104	41.94
	21	82	33.06
Total		248	100
Gentamicin	07	59	24.48
	14	101	41.91
	21	81	33.61
Total		241	100
Piperacillin	07	42	60
	14	28	40
	21	00	00
Total		70	100
Fluconazole	14	36	100
Linezolid	07	1	100
Meropenem	07	28	100
Vancomycin	07	05	100

Least common drug given to the neonates were meropenem (4.42%), vancomycin (2.01%) piperacillin (11.01%), linezolid (0.94), fluconazole (5.97%).

## DISCUSSION

The present observational study found that antibiotics were the most commonly prescribed drug class in tertiary care hospital NICU. WHO defines rational drug medical aid as "Patients receive medication applicable to their clinical want, in doses that meet their individual requirement, for an appropriate period of time, and at the lowest price to them and their community (WHO 1985)". But it does not include laboratory investigations. Ideally it is considered rational if clinical diagnosis is supported by hematological and microbiological data.<sup>10</sup>

Present study revealed that amoxicillin and clavulanate in combination is most commonly used antibiotics (38.99%) followed by gentamicin (37.89%) in NICU of tertiary care hospital. Similar pattern of antibiotic usage was seen in Dutch NICU; wherein penicillin and aminoglycosides are the most frequently used antibiotics.<sup>11</sup> Another study also shows use of penicillins and penicillins with beta-lactamase inhibitors as most commonly prescribed antibiotics (80.6%), followed by aminoglycosides (12%).<sup>12</sup> However, a study done in NICU of UK, shows Gentamicin to be the most frequently used antibiotic.<sup>11</sup>

Other antibiotics like piperacilline, linezolid, fluconazole, meropenam, vancomycin were used less commonly in our

NICU setup. Hsieh et al, study reported that Vancomycin and gentamycin were most commonly prescribed medicine in NICU While Garazzino et al, showed linezolid is likely to have an increasing role in neonates for the treatment of drug-resistant gram-positive infections.<sup>13,14</sup> Fluconazole was commonly used both to prevent and to treat invasive neonatal *Candida albicans* infection, this was concluded by Pacifici et al.<sup>15</sup> Another study of Pacifici et al, showed that meropenem exhibits in vitro activity against an impressive number of community-acquired and nosocomial pediatric pathogens.<sup>16</sup>

## CONCLUSION

The study concludes that the antibiotic prescription pattern at NICU of authors' tertiary care hospital was found rational.

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