

# Antimicrobial pattern in neonatal intensive care unit (NICU) in a tertiary care hospital

Ajay J<sup>1</sup>, Abhishek Patel<sup>2\*</sup>, Govind Auradkar<sup>3</sup>

<sup>1,2</sup>Assistant Professor, <sup>3</sup>Senior Resident, Department of Pediatrics, Navodaya Medical College, Raichur, Karnataka, India.

Email: [ajayj1987@gmail.com](mailto:ajayj1987@gmail.com)

## Abstract

**Background:** Antimicrobials are the most common medications used in NICU. Most often they are prescribed as a part of treatment for sepsis. They are also administered empirically in neonates during their hospital stay even without sepsis. The western countries have moved from empirical approach to evidence based approach but the literature review in developing countries shows the prevalence of irrational prescription of antibiotics because of empirical approach which is driven by the economic constraints of the patients. **Objectives:** To study the pattern of antimicrobial (AMA) drug use in neonates admitted to NICU. **Methods:** This is a retrospective observational study conducted in a tertiary care hospital in south India. The data was collected retrospectively and all the neonates treated with antibiotics were included in the study **Results:** Out of the 102 neonates admitted 76 (74.5%) received antibiotics. 52.6% of the neonates were term and 47.3% were preterm. Amikacin (93.4%) followed by Cefotaxime (68.4%) and Ampicillin (31.6%) were the most common antimicrobials used. 52.6% did not respond to first line of antibiotics whereas only 47.4% responded to first line drugs. **Conclusion:** Majority of the infants (75%) admitted in the NICU received antibiotics during their course of treatment. Greater number of Preterm neonates received antibiotics in comparison to Term neonates. There is decrease in susceptibility of organisms to first line antibiotics leading to exposure of neonates to multiple (>2) antibiotics.

**Key Word:** antimicrobial pattern.

## \*Address for Correspondence:

Dr Abhishek Patel, Assistant Professor, Department of Pediatrics, Navodaya Medical College, Raichur, Karnataka, INDIA.

Email: [ajayj1987@gmail.com](mailto:ajayj1987@gmail.com)

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## INTRODUCTION

Antimicrobials are the most common medications used in NICU. Most often they are prescribed as a part of treatment for sepsis. They are also administered empirically in neonates during their hospital stay even without sepsis<sup>1</sup>. The western countries have moved from empirical approach to evidence based approach but the literature review in developing countries shows the prevalence of irrational prescription of antibiotics because of empirical

approach which is driven by the economic constraints of the patients<sup>2</sup>. There is increased risk of invasive candidiasis and death with use of broad spectrum antibiotics and there is also a risk of necrotizing enterocolitis, late onset sepsis and death with prolonged duration of antibiotics<sup>3</sup>. There is lack of safety, dosing and efficacy of drugs studies in neonates due to ethical concerns and difficulties in recruitment<sup>4</sup>. Further the pre-terms admitted in NICU can be associated with renal and liver dysfunction which excludes them from the trails. These factors have led the clinicians for off-label use of medications<sup>5</sup>. The prolonged and inadvertent use of antibiotics in neonates and especially in pre-term neonates requiring prolonged hospitalization can lead to antibiotic resistance, fungal infections, prolonging hospital stay and also increase in mortality. Further delay in the start on antibiotics in sepsis can lead to increase in mortality of the neonates<sup>6</sup>. There are no standard guidelines for prescribing antibiotics in NICU's in India. The choice of antibiotics is driven by the prevailing neonatal problems in the region. There are also no much data available on the pattern of antibiotic

usage in neonates. Hence the study was conducted to assess the pattern of antibiotic usage in our neonatal intensive care unit.

### METHODOLOGY

This is a retrospective observational study conducted in a tertiary care hospital in south India.

The data was collected retrospectively and all the neonates treated with antibiotics for three months were included in the study. The pattern of antimicrobial usage pattern in NICU was studied retrospectively in a tertiary care teaching hospital.

Those neonates without antibiotics were excluded from the study.

**RESULTS:** A total of 102 neonates were included in the study

**Table 1:** showing proportion of neonates receiving antibiotics

Parameter	Total
Admissions to NICU	102
Neonates received antibiotics	76 (74.5%)

From the above table, of the 102 admissions, 76 (74.5%) neonates required antibiotic

**Table 2:** showing gestational age of the neonates receiving antibiotics

Gestation	Number
Term	40 (52.6%)
Late preterm	22 (28.9%)
Early preterm	14 (18.4%)
<b>Total</b>	<b>76</b>

From the above table 52.6% of neonates were term and 47.3% were preterm.

**Table 3:** showing gender distribution among neonates receiving antibiotics

Gender	Total
Male	40(52.6%)
Female	36(47.4%)

**Table 4:** showing antibiotic profile

Generic name with dosage	Dosage	No. of subjects (%)
Cefotaxime	50mg/Kg IV BID	52(68.4)
Amikacin	7.5mg/Kg IV BID	71(93.4)
Ampicillin	50mg/kg IV BID	24(31.6)
Ceftriaxone	50mg/kg IV BID	9(11.8)
Amoxicillin +Clavulanic Acid	50mg/kg IV BID	28(36.8)
Piperacillin + Tazobactam	100mg IV BID	19(25)
Metronidazole	7.5mg/kg IV TID	6(7.9)
Meropenem	20 mg/kg IV BID	7(9.2)
Vancomycin	40 mg/kg IV QID	6(7.9)
Colistin	50,000 IU/kg TID	5(6.6)

Among the empirically used antibiotics most common was Amikacin 71(93.4%) followed by Cefotaxime 52(68.4%) and Ampicillin 24(31.6%).

**Table 5:** showing change in antibiotics

Change in antibiotics	Number
Yes	40(52.6%)
No	36(47.4%)
<b>Total</b>	<b>76</b>

From the above table 40 (52.6%) neonates required change in antibiotics.

**Table 6:** showing reasons for change in antibiotics

Reason for change	Number
No clinical response	11(27.5%)
Culture report	17(42.5%)
Specific indication	12(30%)
<b>Total</b>	<b>40</b>

From the above table the most common reason for change in antibiotics was Culture and sensitivity report.

### DISCUSSION

In our study, 76(74.5%) neonates out of 102 admissions received antibiotics. This finding comparable to the observations of study by Sonali Suryavanshi *et al.* in a tertiary care centre Pune, India who observed that antibiotics was administered in 70% of the neonates<sup>7</sup>. In another study by Camila Hauge *et al.* a study conducted at Ujjain, India showed usage of antibiotics in 71-89% of neonates<sup>8</sup>. In another study by Megha Sharma *et al.* antibiotics was used in 79-82% of neonates<sup>9</sup>.

Among the neonates included in the study, term neonates were 40(52.6%) and 36(47.3%) were preterm infants. This finding is comparable to the observations of study by Sonali Suryavanshi *et al.* in which 246 (46.6%) were term and 282 (53.4%) were preterm<sup>7</sup>. Among the empirically used antibiotics most common was Amikacin 71(93.4%) followed by Cefotaxime 52(68.4%) and Ampicillin 24(31.6%). In a study by Sonali Suryavanshi *et al.* the majority of neonates (55.9%) received between 1-2 antibiotics, Amikacin, Cefotaxime and Levofloxacin were the drugs most often prescribed<sup>7</sup>. The most commonly prescribed antibiotic groups in a study by Megha Sharma *et al.* aminoglycosides, cephalosporins and fluoroquinolones<sup>9</sup>. In a review of antibiotic usage in NICU by found the common empirical antibiotics used were cefotaxime, ampicillin and aminoglycosides similar to our study<sup>10</sup>. In our study 36(47.4%) neonates responded to first line of antibiotics, while 40 (52.6%) neonates required change in antibiotics. The most common reason for change in antibiotics was Culture and sensitivity pattern followed by specific indication like NEC, Arthritis, Meningitis. In 11(27.5%) antibiotic was changed due to lack of clinical response. In studies from UK by Muller-Pebody B<sup>11</sup> and Italy by Chryssoula Tzialla<sup>1</sup> it was noted that more than 90% of the organisms were sensitive to first line of antibiotics. Where as in our study we noted that only 47.4% responded to first line antibiotics, which was similar

to another Indian study by Sonali Suryavanshi *et al.*. This suggests a rising trend in drug resistance among organisms isolated from NICU.

## CONCLUSION

Majority of the infants (75%) admitted in the NICU received antibiotics during their course of treatment. Greater number of Preterm neonates received antibiotics in comparison to Term neonates. There is decrease in susceptibility of organisms to first line antibiotics leading to exposure of neonates to multiple (>2) antibiotics.

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