

## Study of antibiotic prescription pattern in PICU of a tertiary care hospital

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### ABSTRACT

**Background:** Infectious disease is one of the importance causes of mortality and morbidity in India, therefore pattern of use of antibiotics requires separate study as they differ from adult, Therefore the aim of our study is to observe the antibiotic prescription in the tertiary care hospital.

**Methods:** A prospective observational study was carried out in the children admitted in PICU. The study was started after obtaining the approval from Institutional Ethics Committee. Written informed consent was obtained from a parent or legal guardian of participants.

**Results:** There were 50 patients were enrolled. The maximum antibiotics were prescribed from cephalosporin class (42; 40.38%) which included ceftriaxone, cefixime, cefotaxim, cefpodoxime. The majority of cephalosporins were prescribed in miscellaneous cases followed by respiratory tract infections, gastrointestinal tract, Central nervous tract infections and nil in CVS cases, secondly higher number of antibiotics prescribed was metronidazole and from Aminopenicillin class which includes amoxiclav and ampicillin and another beta lactamase which includes ureidopenicilin and carbepenem. The majority of aminopenicillin were prescribed in miscellaneous group infections followed by respiratory tract infections.

**Conclusions:** From this study, it can conclude that commonly antibiotic were from 3rd generation cephalosporins followed by metronidazole and other  $\beta$  lactamase inhibitor and all of the antibiotics were prescribed as per the national guidelines.

**Keywords:** Antibiotic prescription pattern, PICU

### INTRODUCTION

Antibiotics are one of the commonly prescribed drugs in pediatrics. Because of an overall rise in health care cost, lack of uniformity in drug prescribing and the emergence of antibiotic resistance, monitoring and control of antibiotic use are of growing concern and strict antibiotic polices should be warranted.<sup>1</sup>

Children admitted in PICU are vulnerable to git infection because of associated co morbid conditions and prone to suffer from recurrent infections in the various system of the body. Lower respiratory tract infections are the leading

cause of death in children below 5 five years of age.<sup>2</sup> Several studies focusing on antibiotic prescribing attitudes in hospitalized children indicate that approximately 35% of infants and children admitted to hospitals receive antibiotics and widespread misuse has been reported.<sup>3</sup>

Rational use of drugs forms the corner stone of successful implementation of rational use of medicine.<sup>4</sup>

#### *WHO drug use indicators*

In 1993, who identified 12 core indicators and 7 complementary indicators, which can be used to describe

drug use pattern in a country, region or individual health facility.<sup>5</sup> Advantage of these indicators are that we can compare the prescribing pattern of different settings to assess the effect of given indicators for improvement of drug use.

Authors have used prescribing indicator, which includes percentage of encounters with antibiotic use.

Thus, the aim of our study is to observe antibiotic prescription pattern in Paediatric intensive care unit patients and analyze it as per WHO prescribing indicator and with national guidelines.

## METHODS

The study carried out was prospective observational study carried out in patients admitted to paediatric intensive care unit of tertiary care hospital from (July 2016 to March 2017) after obtaining approval from Institutional Ethics Committee. After explaining the purpose of the study to the patients and guardians the voluntary written informed consent was obtained from legal accepted representatives and assent was obtained from children above 7 years. Patient's demographic data, diagnosis and treatment were recorded in appropriate case record form, all biochemical and microbiological investigations were noted down.

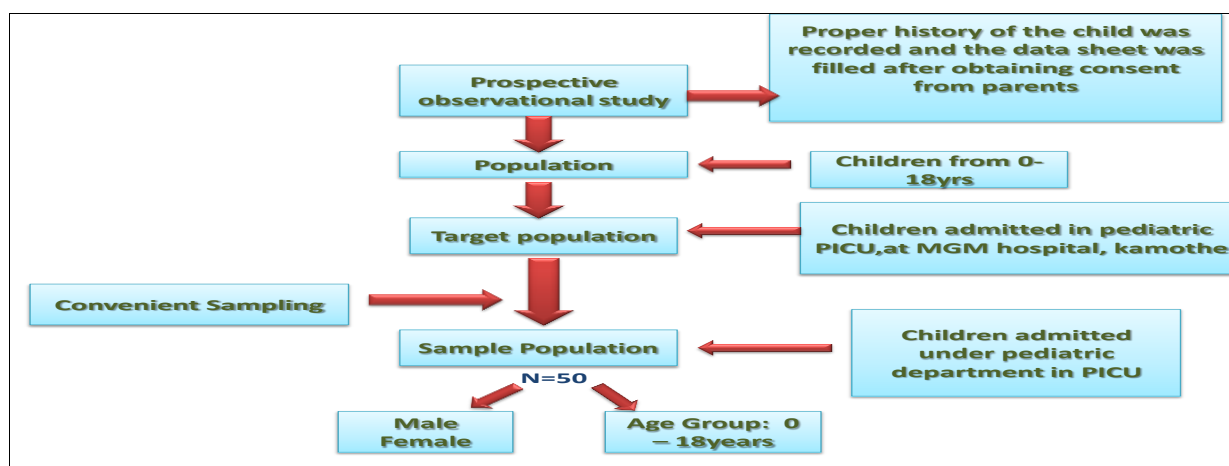


Figure 1: Steps of methodology.

Those patients receiving the antibiotic, details about antibiotic prescription was noted like type of antibiotic, their doses, duration of the treatment were recorded and was correlated with microbiological reports. If any change was observed in antibiotic prescription, it was recorded and the reason behind the changes was analysed. Patients were followed up till the discharge. Authors tried to compare prescription observed by us with national guidelines regarding antibiotic prescription in paediatric population issued by ministry of health and family welfare of India.

### Inclusion criteria

All PICU admitted population and the children whose LAR or parents agrees to give consent.

### Exclusion criteria

- Immunocompromised patients
- Parents not willing to give consent
- Grade 4 malnourished children
- Malignancies

### WHO Core prescribing indicators

1. Average number of drugs per prescription: To Measure the degree of polypharmacy:

#### Calculations

It is calculated by dividing the total number of drugs prescribed by the total number of patient encounters or total number of prescriptions.

Average no. of drugs per prescriptions =

$$\frac{\text{total no. of drugs prescribed}}{\text{total no. of prescriptions}}$$

2. Percentage of drugs prescribed by generic name: To measure the tendency of prescribing drugs by the generic name.

#### Calculations

It is calculated as percentage, it is calculated by dividing the number of drugs prescribed by the generic name by the total drugs multiplied by 100.

Percentage of drugs prescribed by the generic names=

$$\frac{\text{drugs prescribed by generic name} \times 100}{\text{total number of drugs prescribed}}$$

3. Percentage of drugs prescribed from the essential drug list: To measure the degree to which practices conform to a national drug policy, as indicated by prescribing from the national essential drug list or formulary for type of facility surveyed.

*Calculations*

It is calculated as percentage, it is calculated by the number of drugs prescribed which are listed on national essential drug list (NEDL) or Local formulary by the total number of drugs prescribed multiplied by 100.

Percentage of drug prescribed from the essential drug list from NEDL or local formulary =

$$\frac{\text{no. of drugs prescribed} \times 100}{\text{total number of drugs prescribed}}$$

4. Percentage of encounters with an antibiotic:

*Calculations*

% of encounters with an antibiotic=

$$\frac{\text{no. of patient encounters with antibiotics} \times 100}{\text{total no of encounters surveyed}}$$

**Data analysis**

Data was analyzed using proper methods in EXCEL sheets and results were obtained.

Continuous data was analysed using student t test and discrete data using non parametric test P value <0.05 was considered significant.

**RESULTS**

A total of 50 patients were enrolled between age group of 3 months to 14 years with median age of 4.85 years (SD±3.675), with male to female ratio (28:22) in PICU. Difference in sex ratio between male to female admitted in PICU is not significant (P value 0.52797). Disease distribution according to system has been shown in (Table 1).

**Table 1: Disease distribution according to system in PICU.**

RS	GIT	CNS	Miscellaneous
Respiratory distress	Acute gastro enteritis	Bacterial meningitis	Snake bite
LRTI with rickets	Post-operative appendicitis tenderness	Tubercular meningitis	Scorpion sting
Right side empyema	Tetralogy of fallot with gastroenteritis	Generalized Tonic-clonic seizures	Electric burn
RDS with severe dehydration		Seizure disorder with glutamate deficiency	RTA, ho/head, chest, face injury
Aspirational pneumonia		Sulphite oxidase deficiency with epilepsy	Snake bite, non-poisonous
LRTI		Pre B cell ALL with right side facial palsy	Crush injury syndrome
Respiratory distress with cerebral palsy			foreign body in upper esophagus
			Mobile blast injury with haemothorax, haemoperitoneum
			Ingestion of diesel
			Traumatic brain injury, left parieto occipital fracture
			Staphylococcal scalded skin syndrome
			Rocky mountain spotted fever
			Dengue fever
			Generalized lymphadenopathy

During entire tenure of study total 104 antibiotics were prescribed, details of which have been shown in (Table 2).

The maximum number of antibiotics were prescribed from cephalosporin class (42; 40.38%) which were ceftriaxone

(28; 66%), cefotaxim (6;14.2%), cefoperazone (4;9.5%), cefpodoxime (3; 7.1%), cefixime (1;2.38%). The majority of cephalosporins were prescribed in miscellaneous (17;16.3%) followed by respiratory (12;11.5%) and least in Gastrointestinal tract (9;8.6%) and CNS (4;3.8%), secondly higher group of antibiotic prescribed was from metronidazole (17,16.34%) followed by aminoglycoside

(10;9.61%) and Aminopenicillin class accounting (9; 8.6%) which includes amoxiclav (5; 55.5%), ampicillin with cloxacillin (4; 44%) and other beta lactamase (8;7.8%) consisting meropenem (3; 33.3%), piperacillin (6;66.6%). The majority of aminopenicillin were prescribed in miscellaneous followed by respiratory tract cases.

**Table 2: Antibiotic prescribed according to class.**

Antibiotics	RS (12**)	CNS (7**)	GIT (13**)	Miscellaneous (18**)	Total
Cephalosporins <sup>#</sup>	12	4	9	17	42(40.38%)
Aminopenicillin <sup>*</sup>	2			7	9(8.6%)
Other betalactamase	1		2	5	8(7.69%)
Aminoglycoside		1	3	6	10(9.61%)
Metronidazole	1		6	10	17(16.34%)
Flouroquinolone		1	0	2	3(2.88%)
Glycopeptide	4	2	0	1	7(6.7%)
Macrolides	3			0	3(2.88%)
Oxazolidieones			0	0	
Co-trimoxazole			0	0	
Chloramphenicol			0	0	
Sulfonamide			0	0	
Tetracycline			3	1	4(3.8%)
Collistin				1	1(9.61%)
Total	23	8	23	50	104

<sup>#</sup>Cephalosporins included ceftriaxone(28), cefixime(1), cefpodoxime(3), cefotaxim(6), cefoperazone(4), <sup>\*</sup>Amonopenicillin includes co-amoxiclav(5), Ampicillin with cloxacillin(4), Other betalactamase includes meropenem(3), piperacillin (6) and glycopeptides includes vancomycin(6), Aminoglycoside includes Amikacin(8), clindamycin(1). RS = respiratory system, CNS= Central nervous system, GIT = Gastrointestinal tract infections, Miscellaneous.

\*\* - Total number of cases

**Table 3: System wise prescription of drugs.**

System	PICU
Respiratory	3 <sup>rd</sup> Cephalosporin 52.17%
	Glycopeptide 17.13%
	Flouroquinolone 0%
	Aminoglycoside 0%
Gastrointestinal	3 <sup>rd</sup> Cephalosporin 39.13%
	Aminoglycoside 13.04%
	Tetracycline 3.04%
	Metronidazole 26.08%
Miscellaneous	3 <sup>rd</sup> Cephalosporin 34%
	Aminoglycoside 12%
	Metronidazole 20%
	Fluroquinolone 4%
Central Nervous sytem	3 <sup>rd</sup> Cephalosporin 50%

Overall the highest antibiotics were used in miscellaneous (50; 48.07%) followed by respiratory tract infections (23;22.11%), Gastrointestinal tract system (23;22.11%) and by central nervous system (8; 7.69%). Among the total number of antibiotic prescriptions for Respiratory tract, the

highest class was cephalosporin followed by glycopeptide, macrolide, aminopenicillin. For CNS highest number prescribed were cephalosporin followed by glycopeptide, aminoglycoside and flouroquinolone. For miscellaneous the highest number of prescribed antibiotic was from cephalosporin followed by metronidazole, aminopenicillin and aminoglycoside. For Gastrointestinal tract infections cephalosporin, followed by metronidazole, aminoglycoside and teracycline. System wise prescription of antibiotics in PICU has been shown in (Table 3).

Total number of antibiotics prescribed during entire stay has been shown in (Table 4) which shows that maximum prescribed antibiotics were from miscellaneous out of total (17) cases, single antibiotic was prescribed to 7 cases, two antibiotics prescribed to 3 cases, three antibiotics to 3 cases, four antibiotics to 3 cases and five patients received two antibiotics, similarly for other category has been shown.

Antibiotics prescribed at a time simultaneously for example in Miscellaneous group cases received two antibiotics together in 2 cases, three antibiotics were

prescribed together to 2 cases and four antibiotics were prescribed to 1 case, similarly has been shown for other classes in (Table 5).

**Table 4: Total Number of antibiotics prescribed during entire stay.**

System	Antibiotic					
	Single	Two	Three	Four	Five	Zero
CNS (7**)	1	3	2	0	0	1
RS (12**)	4	4	3	1	0	0
GIT (13**)	0	4	4	1	1	3
MISC (18**)	7	3	3	3	2	0

\*\* total number of cases

**Table 5: Antibiotics prescribed at a time simultaneously.**

System	Two	Three	Four	Five
CNS	3	0	0	0
RS	5	0	0	0
MISC	2	2	1	0
GIT	4	5	2	0

Who core prescribing indicators has been shown in (Table 6) as average number of antibiotic per prescription was 2.125%, 0 % patients received antibiotic by generic name, 92% cases encounter with antibiotics and 70.5% has been prescribed from essential drug list.

**Table 6: WHO core drug prescribing indicators.**

WHO core prescribing drug use indicator	Results
Average no of antibiotic per prescription	2.125
% of drugs prescribed by generic name	0%
% of encounters with antibiotics	92%
% of drug prescribe from the WHO model essential drug list	70.5%

## DISCUSSION

In present we observed the gender ratio F:M (22:28) and median age of 4.3 years of the participants. In this study, cephalosporins (40.38%) were most commonly prescribed antibiotic followed by metronidazole (17.34%) and aminopenicillin (8.6%). ceftriaxone (28; 26.9%), followed by metronidazole (17.34%) amoxycylav (4.8%) and amikacin (8.6%) were most frequently prescribed similar results in the Kathmandu valley study also reported that cephalosporins were the most commonly prescribed antibiotics followed by penicillin. Among the cephalosporin, ceftriaxone were commonly prescribed.<sup>1</sup> A study carried out in a tertiary hospital of Bangladesh reported that ampicillin, gentamycin, amoxicillin, cloxacillin and ceftriaxone were commonly prescribed.<sup>6</sup> A

similar study carried out in eastern Nepal reported that gentamycin, ampicillin, crystalline penicillin and cefotaxim were commonly prescribed antibiotics whereas in this study ceftriaxone and amoxicillin were prescribed from same class.<sup>7</sup> A study in Chandigarh by Sharma et al, showed that aminoglycosides (amikacin), cephalosporins (cefotaxime), quinolones (ciprofloxacin), and cloxacillin were commonly prescribed and our study shows that ceftriaxone (cephalosporins) were prescribed.<sup>8</sup> The pattern of antibiotic prescription so far in different studies exhibits overall similar trends in indoor patients were according to National treatment guidelines for antimicrobial use in infectious Diseases.<sup>9</sup> The most common indication of antimicrobial used in this study was lower respiratory tract infections and antimicrobials prescribed were mostly from Aminopenicillin class followed by cephalosporins and aminoglycoside. A study from Nepal done in paediatric hospital of Kathmandu valley and similar study done in east Indian teaching hospital showed Cephalosporin was the top most frequently prescribed antibiotics followed by penicillin group.<sup>1,10</sup> A study from Gujarat showed that highest number of antimicrobials were prescribed in respiratory tract infections and majority drugs used were from beta lactam and aminoglycosides group.<sup>11</sup>

In this study authors have observed that (24%) received single antimicrobial agent however which was different than study carried out in Kathmandu valley reported that (93%) of patients was prescribed one antibiotic.<sup>1</sup> Prescribing of two or more antimicrobial was common (60%) in paediatric cases, where as in this study it came out to be (28%) for two and (24%) were prescribed three antimicrobials.<sup>8</sup> 43% of cases prescribed antibiotics.<sup>12</sup>

Similarly, another study done in showed that 55% cases were prescribed antibiotics, which shows that antibiotics are being used in a higher spectrum.<sup>13</sup>

Clinicians choice was empirical and antibiotic treatment was guided by the results of laboratory test in (20%) with low yield of positive culture results, as similar scenario was observed in other studies.<sup>1,10</sup>

Our study has few limitations like:

- Sample size was limited
- As majority of studies have been reported from PICU wards, whereas our study was performed in children admitted in PICU that may be reason for difference observed in their study compared to our study
- Study was conducted only in one facility
- The results may generate may not be generalized and we excluded patients from wards and neonatal intensive care units.

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