



**DRUG UTILIZATION EVALUATION OF ANTIBIOTICS IN PEDIATRIC PATIENTS OF  
A TERTIARY CARE HOSPITAL IN CALICUT**

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**ABSTRACT**

**Background:** Determining the trends of drug utilization evaluation of antibiotics for pediatrics help to provide information of prescribing pattern to all health care professions and that will prompt judicious use of antibiotics.

**Objectives:** To evaluate prescribing pattern of antibiotics in pediatrics and to check its rationality. **Methodology:**

A retrospective observational study pattern was followed for the study at PVS Hospital (P) Ltd, Calicut. The case sheets and prescription of age group 1 - 16 years were collected. The antibiotic and their doses prescribed were compared with the standard guidelines for appropriateness and rationality. **Results:** Out of 135 pediatric patients 60% were male and 40% were female with 81% of patients in the age group 0-5 years. As per the study respiratory tract infection was the major cause of hospitalization in pediatric that covered 49% of all the clinical conditions encountered. Among the antibiotics prescribed 83% were cephalosporin with 3<sup>rd</sup> generation cephalosporin being the commonly prescribed one. The study showed 65% patients were prescribed with antibiotic monotherapy and 35% with antibiotic combination therapy with amoxclav being the mostly prescribed antibiotic combination. It was also found that 64.5% of antibiotics were prescribed in the injection form. Prevalence of antibiotic sensitivity test was found to be 0.74%. **Conclusion:** Antibiotics are frequently prescribed in pediatric population without proper antibiotic sensitivity testing. The clinical pharmacy department should give more emphasis in optimal prescription of antibiotics with proper follow up on whether the pediatrics follows the therapy to ensure the outcome of therapy.

**KEYWORDS:** Drug utilization evaluation, pediatrics, antibiotics, standard treatment guidelines, Gyssen's rationality categorization.

**INTRODUCTION**

Antibiotics are medicines used to forestall and treat bacterial contaminations or infections. For infections in babies and kids, the effective anti-infection treatment relies essentially upon quick analysis of the disease, recognizable proof of pathogenic microorganisms, and proper utilization of specific pharmacokinetic and pharmacodynamic information on antibiotic agents in children. In pediatrics, absorption, distribution, metabolism, and excretion of medications may vary impressively in correlation with grown-ups. Studies show that medication related errors in pediatric patients are found to cause hurt were multiple times more probable in kids than in the grown-up populace. Pediatric patients are at a higher danger of encountering these errors than grown-ups in view of the requirement for a portion figuring dependent on a patient's age, weight (mg/kg), body surface area (mg/m<sup>2</sup>), and clinical condition.

Drug utilization evaluation, defined by the American Society of Health System of Pharmacist (ASHP) as systemic process for monitoring and evaluating therapeutic use of drugs to assure that they provided appropriately, safely and effectively.<sup>[1]</sup> Antibiotics are the substances that destroy or inhibit the growth of other bacterias and are used in the treatment of external or internal infections.<sup>[2]</sup> Antibiotic resistance threatens the effective prevention and treatment of ever increasing infections caused by bacterias.<sup>[3]</sup> One method to help reduce antibiotic resistance is to ensure appropriate prescription and use of empiric antibiotics.<sup>[4]</sup> Pediatric patients are at higher risk of experiencing medication error than adults because of the need for a dose calculation based on a patient's age, weight (mg/kg), body surface area (mg/m<sup>2</sup>) and clinical condition. Antimicrobial susceptibility testing (AST) is a laboratory methodology performed by clinical technologists (clinical lab researchers) to distinguish which antimicrobial routine is explicitly compelling for individual patients. For a bigger scope, it helps in the

assessment of treatment administrations gave by clinics, facilities and public projects for control and anticipation of irresistible illnesses.(10) Consequences of Antimicrobial susceptibility testing are basic for choice of conclusive antimicrobial chemotherapy of bacterial infections analyzed in individual patients, including pediatric patients. The present study determined the drug utilization evaluation of antibiotics in the pediatric patients.

#### MATERIALS AND METHODS

**Study Site:** PVS Hospital (P) Ltd, a 350 bedded multispecialty tertiary care hospital in Calicut.

**Study design:** Retrospective observational cross-sectional study design was followed.

**Study population:** All the inpatients pediatrics prescribed with antibiotics were included from January 2022 to June 2022. Casualty or emergency department pediatric prescriptions were not taken.

**Data collection:** A random selection and evaluation of case sheet and prescription from all inpatients units of age group 0-16 years was carried out. On assessing each

case sheets/ prescriptions the required data were collected. The various parameters in observed included patient demographics, medical history, number of antibiotics prescribed, details of drug prescribed, number of antibiotics given as monotherapy and combination therapy, sensitivity pattern test and other laboratory investigations. Further the antibiotic therapy given was compared with standard treatment guideline or evidence-based medicine. Oxford AHSN guideline and gyssens rationality categorization were used.

**Statistical analysis:** Descriptive analysis was done with the help of Microsoft Excel.

#### RESULTS

A total of 135 pediatric cases prescribed with antibiotics were collected and analyzed. Among the 135 cases 81 were male (60%) and 54 were female (40%). The study found 80.74% cases in the age group of 5 years and below, 11.85% in 6-10 years and 6.66% in 11-16 years respectively. The mean age of pediatric patients enrolled in study were found to be 2.4. Table No. 1 represents the demographics characteristics of the study cases.

**Table No. 1: Demographic details**

Demographic Characteristics		Number	Percentage
Gender	Male	81	60%
	Female	54	40%
Age group	≤5 years	109	80.74%
	6-10 years	16	11.85%
	11-16 years	9	6.66%

The common reason for hospitalization of pediatric patients was found to be respiratory tract infections which included 66 patients (49%) followed by 15

patients (11%) with inflammatory conditions, 14 patients (10.3%) with renal disorders and 13 patients (10%) with fever.

**Table No. 2: Clinical condition encountered in the study.**

Sl no	Clinical conditions	Number of patients	Percentage
1	Respiratory infections	66	49
2	Inflammatory conditions	15	11
3	Fever	13	10
4	Renal disease	14	10.3
5	Central nervous system infection	6	4.5
6	Hormonal disorder	7	5
7	Burns	5	4
8	Genetic abnormality	2	1.5
9	Gastrointestinal tract disease	3	2
10	SARS Covid positive	1	0.7
11	Others	3	2

Individual prescription analysis was done for all the patients included in the study it was found that cephalosporins (83 patients, 43.2%) was the most common class of antibiotic prescription followed by penicillin (63 patients, 32.8%) and aminoglycoside (24 patients, 12.8%).

**Table No. 4: pPrescribing pattern of antibiotics.**

Sl no.	Class of antibiotics	No. of patients	Percentage (%)
1	Cephalosporins	83	43.2
2	Penicillin	63	32.8
3	Aminoglycoside	24	12.8
4	Metronidazole	7	3.6
5	Fluroquinolones	4	2
6	Macrolide	5	2.6
7	Linezolid	3	1.5
8	Carbapenam	3	1.5

The fourth and fifth generation cephalosporins are reserved for severe infections or for those with weakened immune system. The subjects have undergone monotherapy as well as combination therapy depending

upon the severity of their clinical presentation. It was about 30% cases involving 2 antibiotics, 2 % involved 3 antibiotics, 1.5% involved 4 antibiotics and 0.75% involved in 5 and 6 antibiotics.

**Table No. 4: Number of antibiotics prescribed.**

No. of antibiotics	No. of patients	Percentage
Mono therapy	88	65
Combination therapy		
2	40	30
3	3	2
4	2	1.5
5	1	0.75
6	1	0.75

While assessing the prescription, out of antibiotics prescribed 31.25% was combination therapy. Major combination therapy used were Amoxicillin and

Clavulanic acid (25 patients,13%) followed by Piperacillin and Taxobactam (19 patients, 10%) and Ceftriaxone and Sulfamethoxazole (8 patients, 4.1%).

**Table No. 4: Combination therapy of antibiotics used.**

Antibiotics	No. of prescription	Percentage %
Amoxicillin + Clavulanic acid	25	13
Piperacillin + Tazobactam	19	10
Ceftriaxone + Sulbactam	8	4.1
Ampicillin + Cloxacillin	7	3.6
Amoxicillin + Potassium clavulanate	1	0.5
Trimethoprim + Sulfamethoxazole	1	0.5

The antibiotic in injection form was prescribed in 127 patients, prescriptions making a total of 64.5% antibiotics. Syrups in 49 patients, to be total of 25%

antibiotic. Tablets in 9 patients, to be a total of 4.5%. Suspensions in 1 patient, to be a total of 0.5%.

**Table No. 5: Dosage forms of antibiotics prescribed.**

Sl no.	Dosage forms	No. of prescription	Percentage
1	Injections	127	64.
2	Syrups	49	25
3	Tablets	9	4.5
4	Suspension	1	0.5
5	Others	11	5.5

Among the 135 of total cases there is only one sensitivity test was done. 0.74% of prevalence of sensitivity test is derived by comparing the number of people found to have tested with the total number of people studied. The guideline specified penicillins as drug of choice for bronchopneumonia (most common infection in our study), but in our study second generation cephalosporin

(cefuroxime) was the drug of choice. The dosing pattern was also different from the guidelines. In contradiction to this the study shows adherence to treatment guidelines for UTI in using the combination drug Amoxiclav as the first line agent. Overall partial non-adherence to treatment guidelines was found.

**Table No. 6: Rationality assessment (Gyssens category).**

The category of therapy rationality	Number (%)
0 = Rational	1
1 = Not on time	6
11 A = Not exactly dose	48.5
11 B = Not exactly interval	6
11C =Not exactly administration	2.5
111A = Giving too long	4
111B = Giving too short	9.5
IV A = More effective antibiotics	3.5
IV B =More toxic antibiotics	3
IV C=Cheaper antibiotics	2.5
IV D=More specific antibiotics	9.5
V = Antibiotics without indication	4

## DISCUSSION

While assessing 135 pediatric patients, most were diagnosed with respiratory tract infections. Among respiratory tract infections, Bronchopneumonia (28 patients, 21%) was most frequent among pediatric patients. The drug classes involved cephalosporins, penicillin, aminoglycoside and other antibiotics. Cephalosporin was the most commonly prescribed drug group, with second generation cephalosporin (20.8%, cefuroxime) as the most frequently prescribed one. This is followed by penicillin and aminoglycosides. Oral cephalosporins are commonly utilized for diseases that were easy to treat. For instance, a standard instance of streptococcus throat infection may be treated with a course of oral cephalosporins. Intravenous (IV) cephalosporins are utilized for more severe infections. Cephalosporins are assembled dependent on the sort of microbes that they're best against. The first generation cephalosporin prescribed included cephalexin (2 i.e. 2.4%), second generation involved cefuroxime (40 i.e. 48.2%). Third generation involved cefotaxime, ceftriaxone, cefpodoxime, cefixime altogether making upto 49.4 % of the cephalosporins prescribed.

The subjects have undergone monotherapy as well as combination therapy depending upon the severity of their clinical presentation. It was also found that 65% of analyzed cases followed only one or the same antibiotic, making a total of 135 cases, have been used to achieve the appropriate therapeutic effect. Two antibiotic followed in 40 inpatient cases. Three antibiotic was followed in 3 inpatient case only, 4 antibiotics was followed in 2 inpatient cases and 5, 6 antibiotics in 1 patient. Among the antibiotics prescribed 31.25% was combination therapy with Amoxiclav being the most frequently used combination. The antibiotic in injection form was prescribed in 127 patients, prescriptions making a total of 64.5% antibiotics. Syrups in 49 patients, to be total of 25% antibiotics. Tablets in 9 patients, to be a total of 4.5%. Suspensions in 1 patient, to be a total of 0.5%. The average number of antibiotics per encounter was 1.45, percentage of drugs prescribed in generic name was 1.5% and the percentage of encounters with an injection prescribed was 64.5%.

## CONCLUSION

Antimicrobials are frequently prescribed in pediatric population. Hence, their judicious use in clinical practice is urgent need to reduce antimicrobial resistance, cost of therapy and ADR's. Drug utilization studies may help to provide information of prescribing pattern to all health care professions and that will prompt judicious use of antibiotics. After all the data collected for the drug utilization evaluation of antibiotic use in pediatric population; a total of 135 cases were analyzed. The study population was pediatrics falling between one day to sixteen years of age and the mean age of subjects present was 2.4 years. Among 135 patients, assess 196 antibiotics prescribed and it varied from use of a single antibiotic to more than one antibiotic depending on the response produced in individual patients. The most administered dosage form was injections. A total of 8 antibiotics were prescribed when analyzed categorically, where the most prescribed individual antibiotic was cefuroxime and the most commonly prescribed drug combination was amoxclav with 13%. Cephalosporins was the most commonly prescribed antibiotic class, constituted for about 43.2% of prescribed antibiotics followed by penicillins for about 32.8%. A total of 11 class of clinical conditions were encountered, respiratory tract infections (49%) being the most common followed by other inflammatory conditions (11%). Respiratory infections includes 4 upper respiratory tract infections and 17 lower respiratory tract infections after involving both bronchopneumonia and wheezing associated lower tract infections. The prescription of antibiotics through their generic name was for only about 1.5%. The increased brand name prescription of drugs may often misguide the patient bystanders to follow the same brand of medicine prescribed by the physician to produce the intended effect and may further contribute to increased cost of treatment. Antibiotic sensitivity tests were only carried out in single patient in our study. Though no unwanted effects in the studied population was noticed or reported during the study period. These results have aided in identifying the trends of drug utilization in pediatric patients.

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