



**RESEARCH ARTICLE**

**A Study to Assess and Analyze the Prescribing Pattern of Antibiotics in the  
Pediatric Department of a South Indian Tertiary Care Teaching Hospital**

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**ABSTRACT**

To assess and analyse the prescribing and utilisation pattern of anti-microbial agents by the physicians to the in-patients in paediatric department and to study various parameters of rational drug use. A prospective observational review of the antibiotic prescription was carried out in the paediatric department of a tertiary care teaching hospital. 200 case records of the patients were identified, assessed, evaluated and analysed for the rational use of antibiotics for a period of 6 months. Total of 200 inpatient prescriptions were collected. Majority of the patients (43%) were in the age group 1-5 years. Male patients (61%) were comparatively more than female patients (39%). Majority of the patients [135 (67.5%)] were prescribed with single antibiotics. Out of 200 prescriptions, Cephalosporins [117 (41.34%)] were the most widely prescribed antibiotic class. In this study, 164 (57.95%) patients were treated with monotherapy and 119 (42.05%) were treated with combinational therapy. The total number of antibiotics prescribed by generic name was 50 (17.72%) and by brand name was 233 (82.3%). Pneumonia (19.5%) was the most prevalent diagnostic condition followed by dengue fever (17.5%). Antibiotic prescribing pattern was analysed and rationality of the prescriptions were assessed for parameters such as dose, frequency, route of administration of antibiotics and drug interactions. The emerging antimicrobial resistance is a global concern. So, detailed rational knowledge of antibiotic prescribing pattern must be implemented in the clinical practice.

**KEYWORDS**

Prescribing Patterns, Antibiotics, Paediatric, Rational Drug Use

**INTRODUCTION**

Paediatrics is the branch of medicine dealing with the development, diseases and disorders of children.<sup>1</sup> The world population constitutes of about 28% of children and infants who are most susceptible to diseases due to under development of immune system.<sup>2</sup>

Infancy and childhood is a period of rapid growth and development. Compared to adult medicine, drug use in paediatrics is not extensively researched and the range of licensed drugs in appropriate dosage form is limited. Infants and children are among the most vulnerable population groups to contract illnesses.<sup>1</sup>

Antibiotics are the substances produced by microorganisms, which selectively suppress the growth or kill other microorganisms at very low concentrations. Antibiotics are the key drugs for treatment of infections and are among the most

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commonly prescribed drugs in paediatrics department.<sup>2</sup> Antibiotics were once considered ‘miracle drugs’ and have been used for decades to effectively treat a variety of bacterial infections.<sup>3</sup>

The use of antimicrobial agents, especially antibiotics has become a routine practice for the treatment of paediatric illnesses. However, there are also reports of irrational use of antibiotics, which may even lead to infections that are worse than the originally diagnosed ones.<sup>1</sup> This affects the paediatric population as they have different pharmacokinetic and pharmacodynamic properties.<sup>2</sup>

Rational antibiotic prescription is very important to avoid multiple drug resistance, treatment failure, non-compliance and increase in cost of treatment.<sup>4</sup> For all drug users rational drug therapy is important, but it is of utmost importance for children. Several barriers exist in rational prescribing of drugs ranging from lack of objective information, continuing education, training in rational drug use and the method of promotion employed for pharmaceutical products. For instance, because of irrational antibiotic use, resistance to recent antibacterials have been steadily increased to a higher level. The limited information available on drug use pattern throughout the world indicated that drugs are not optimally used, where inappropriate use has serious health and economic consequences for individuals, community negatively affects the success of national health care system.<sup>5</sup>

Drug prescribing in paediatric wards is done by various types of health professionals. The administration of drugs to children requires a knowledge and expertise primarily because the doses prescribed for children are often in an amount which is not commercially available in paediatric label.<sup>5</sup>

Appropriate antimicrobial drug use is defined as use that maximizes therapeutic impact while minimizing toxicity and the development of resistance. In practice, this involves prescribing antimicrobial therapy when and only when it is required and is beneficial to the patient, targeting

therapy to the desired pathogens, and using the appropriate drug, dose, and duration.<sup>6</sup>

By considering the above facts the study entitled: “A Study to Assess and Analyze Prescribing Pattern of Antibiotics in the Paediatric Department of a South Indian Tertiary Care Teaching Hospital”, was taken to analyze the prescription pattern of antibiotics. This will help to promote the rational use of antibiotics and minimize medication errors.

## **MATERIALS AND METHODS**

A prospective observational study was carried out for a period of 6 months in the paediatric in-patient department of south Indian tertiary care teaching hospital. Patients of age less than or equal to 14 years, patients of either sex and those prescribed with parenteral and oral antibiotic preparations were included in the study. Case records of patients in ICU, other wards and discharged within 24 hours of admission from paediatrics ward, patients prescribed with topical, ophthalmic antibiotic preparations, neonates, patients who died during their hospital stay or those who underwent incomplete treatment were excluded.

### **Ethical issues**

Ethical clearance was obtained from the Institutional Ethics Committee, Bapuji Pharmacy College, Davangere.

### **Study Procedure**

Data collection form was designed and data was collected from case sheets of in-patients in paediatric department. The collected data was analysed for no. of antibiotics per prescription, distribution of gender based on antibiotic prescribed, commonly prescribed class of antibiotics, age group receiving maximum number of antibiotics, duration of antibiotic therapy, antibiotic utilization pattern, route of administration of antibiotics etc. The results were presented as percentage. The rationality of antibiotic usage was assessed and analysed by interpreting the collected data with standard references (Micromedex®, Lexicomp, and BNF). The medication order problems like possible drug-drug interactions, dose & duration

errors was also evaluated. The data was analysed and represented graphically.

## RESULTS

A total of 200 patients with antibiotic prescriptions were enrolled into the study, out of which 122 (61%) were male patients and 78 (39%) were female patients. In a total of 200 prescriptions, majority of the patients were in the age group of 1-5 yrs. (N= 86, 43%) followed by 1 month- < 1 yr. (N= 46, 23%), 5yrs- < 10 yrs. (N= 42, 21%) and 10-14 yrs. (N=26, 13%).

Maximum no. of patients were admitted for 5 days [46, 23%] duration of treatment followed by 4 days [34, 17%] of treatment. 135 (67.5%) prescription were given single antibiotic, 51 (25.5%) & 10 (5%) prescriptions were respectively given 2 and 3 antibiotics and 4 (2%) prescriptions were given 4 antibiotics. Pneumonia (19.5%) was the most prevalent diagnostic condition followed by dengue fever (17.5%), Fever (14.5%) and WALRI (12.5%).

Table 1: Diagnosis Pattern in Different Age Groups

Diagnosis	1mon th- < 1 yr	1yr - < 5 yr	5yr- <10yr	10yr - 14yr	Total
Pneumonia	10	25	2	2	39
Dengue Fever	1	17	10	7	35
Fever	7	7	9	6	29
WALRI	7	18	0	0	25
Hepatitis	0	3	2	1	6
Viral Encephalitis	0	1	0	1	2
Combination	6	1	4	3	14
Others	16	14	14	6	50

In 200 prescriptions, there were 117 (41.34%) Cephalosporins, 78 (27.56%) Penicillins, 42 (14.84%) Tetracyclines, 14 (4.94%) Aminoglycosides, 13 (4.59%) Macrolides, 12 (4.24%) Fluoroquinolones, 4 (1.41%) Glycopeptides, 2 (0.73%) Carbapenems and 1 (0.35%) Oxazolidinediones.

Table 2: Categorization of Class of Antibiotics

Antibiotic Class	Frequency	Percentage (%)
Cephalosporins	117	41.34
Penicillins	78	27.56
Tetracyclines	42	14.84
Aminoglycosides	14	4.94
Macrolides	13	4.59
Fluoroquinolones	12	4.24
Glycopeptides	4	1.41
Carbapenems	2	0.73
Oxazolidinediones	1	0.35
Total	283	100

Out of 283 antibiotics prescribed, Amoxicillin + Clavulanic acid (73, 25.79%) was the most frequently prescribed antibiotic, followed by Ceftriaxone + Tazobactam (46, 16.25%).

Table 3: Frequency of antibiotics prescribed

Antibiotics	Frequency	Percentage
A+C	73	25.79
C+T	46	16.25
Doxycycline	42	14.84
Cefazoline	35	12.36

Ceftriaxone	18	6.36
Amikacin	13	0.04
Azithromycin	13	4.59
Cefotaxime	11	3.89
Levofloxacin	10	3.53
Ampicillin	4	1.41
Cefodoxime	4	1.41
Vancomycin	4	1.42
Ceftazidime	2	0.70
Meropenem	2	0.70
Benzathine Penicillin	1	0.35
Cefixime	1	0.35
Gentamicin	1	0.35
Linezolid	1	0.35
Moxifloxacin	1	0.35
Ofloxacin	1	0.35
Total	283	100

Out of 283 prescribed Cephalosporins, combinational (39.31%) were the most common followed by Cefazoline, Ceftriaxone (15.38%), Cefotaxime (9.4%), Cefodoxime (3.41%), Ceftazidime (1.7%) and Cefixime (0.85%).

Table 4: Categorization of Cephalosporin Antibiotics

Cephalosporins	Frequency	Percentage (%)
Cefixime	1	0.85

Ceftazidime	2	1.7
Cefodoxime	4	3.41
Cefotaxime	11	9.40
Ceftriaxone	18	15.38
Cefazoline	35	29.91
Combination	46	39.31
Total	117	100

233 (82.3%) antibiotics were prescribed in brand name and 50 (17.72%) antibiotics were prescribed in generic name. Most of the antibiotics were prescribed by IV route (N=212, 74.91%), followed by oral route (N=70, 24.73%) and IM (N=1, 0.35%).

Table 5: Route of Antibiotic Administration

Route of administration	Frequency	Percentage (%)
Oral	70	24.73
IV	212	74.91
IM	1	0.35
Total	283	100

In oral dosage form, 52 (18.37%) tablets, 17 (6.02) syrups and 1 (0.35%) capsules were prescribed. 164 (57.95%) patients were treated with monotherapy and 119 (42.05%) were treated with combinational therapy. A maximum of 119 (42.05%) prescriptions with FDC were found, of which most common was Amoxicillin + Clavulanic acid [73 (61.35%)] followed by Ceftriaxone + Tazobactam [46 (38.65%)]. 1 (1.72%) Major drug interaction, 31 (53.45%) moderate drug interactions and 26 (44.83%) minor drug interactions were found. A total of 32 frequency errors and 16 dose errors were found.

## DISCUSSION

Antibiotics represent the most commonly used drugs in paediatrics department. Their irrational use lead to number of consequences in term of cost, drug interactions, hospital stay, bacterial resistance and medication errors.

In our study, out of 200 prescriptions, 122 (61%) patients were male and 78 (39%) were females. This study also reveals a male predominance over female and was similar to the study conducted by Choudhary DK *et al.*<sup>2</sup>

The present study reveals that the most prevailing age group among paediatrics who receive antibiotics was 1-5 years (43%). This indicates that there are more chances of infections in 1-5 years age group. Same findings were seen in other studies like Choudhary DK *et al.*<sup>2</sup> and Shivaleela. *et al.*<sup>4</sup>

Maximum number of patients were admitted for 5 days [46(23%)] duration of treatment followed by 4 days [34(17%)] duration of treatment.

Out of 200 prescriptions, majority of prescriptions were given with single antibiotics [135(67.5%)] followed by two antibiotics [51(25.5%)] which was contradictory to studies conducted by Lelise Ambaw. *et al.*<sup>3</sup> and Shivaleela. *et al.*<sup>4</sup> studies. Number of antibiotics per prescriptions should be as low as possible to prevent unfavourable outcomes of polypharmacy such as increased risk of drug interactions, increased cost of therapy, non-compliance and emergence of resistance.<sup>4</sup>

Most prevalent disease among study was Pneumonia and is treated commonly by Amoxicillin + Clavulanic acid and this result was comparable with Choudhary DK. *et al.*<sup>2</sup> study. Benzyl penicillin and Gentamicin / Cefotaxime were found to be mostly used antibiotics in case of Pneumonia in N. Palikhe. *et al.*<sup>1</sup>

It is observed that use of cephalosporin class [117(41.34%)] of antibiotic among patients was higher than other class of antibiotics such as Penicillin [78(27.56%)], Tetracyclines [42(14.84%)], Aminoglycosides [14(4.94%)], Macrolides [13(4.59%)], Glycopeptides [4(1.41%)], Carbapenems [4(0.73%)] and

Oxazolidinediones [1(0.35%)]. Cephalosporins were widely prescribed because of its broad spectrum of activity and tolerance across age groups, similar result was noticed in N. Palikhe. *et al.*<sup>1</sup> study.

Among Cephalosporins, Cefazoline [35(29.91%)] was found to be widely prescribed one. This result /was contradictory to study conducted by Shivaleela. *et al.*<sup>4</sup> where Cefixime was the most widely prescribed group of antibiotics.

In a large number of prescriptions drugs were prescribed by brand names, where less expensive generic equivalents are available. Only 17.72% were prescribed by generics, this finding was contradictory to Shivaleela. *et al.*<sup>4</sup> and Lelise Ambaw. *et al.*<sup>3</sup> study. This could be because the prescribers are familiar to the brand names than generic names of the drug products. This variation possibly which may be related to vigorous promotional strategies by pharmaceutical promoters which might have influenced the clinicians, and may have contributed immensely to this high rate. Generic prescribing would rationalize the use and reduce the cost of drug therapy.

Most of the drugs were administered through parenteral route [213(75.26%)] and followed by oral route [70(24.73%)] which is connected to study conducted by Shivaleela *et al*, Palikhe. N *et al* and Sriram. *et al.*<sup>4,1,7</sup>. Parenteral route is expensive and requires trained personals for administration. WHO recommends lesser use of injections as it is helpful in reducing the cost of treatment and its disadvantages, but some factors facilitates the use of this route such as children especially neonates and infants who do not volunteer to take oral medication and IV administration of antibiotics has been viewed by most clinicians as the best, safest, and quickest method of initiating therapy.<sup>3</sup>

In our study, majority of patients were responding to monotherapy [164(57.95%)] and minority were responding to combinational therapy [119 (42.05%)]. In combinational therapy, Amoxicillin+ Clavulanic acid was the most prescribed drug.

In oral dosage form, the most commonly used dosage form was tablet (18.37%) compared to syrup (6.02%) and this finding was different from study conducted by Shivaleela *et al.*<sup>4</sup> Children are comfortable with oral dosage forms like syrup and drops compared to tablets and capsules, it increases the compliance and helps in completing the treatment regimen.<sup>4</sup>

Inappropriate prescribing involves over prescribing & under prescribing including dose, frequency & duration. In this study, inappropriate dose, frequency & duration were also observed and it was not indicated in most medical cards reviewed.

In our study, Moderate DDI's [31 (53.45%)] were found to be more compared to minor DDIs [26(44.83%)] and major DDI's [1(1.72%)] which may be due to improper knowledge about interactions, hospital formulary restriction and individual clinical experiences.

Prescribers have to document all necessary information on patient's medical card, minimize empiric antibiotic prescribing habit, always note contra-indications, and possible drug-drug interactions prior to concomitant drug administration.

## CONCLUSION

The use of antimicrobial agents, especially antibiotics has become a routine practice for the treatment of paediatric illnesses. However, there are also reports of irrational use of antibiotics, which may lead to infections that are worse than the originally diagnosed ones. The emerging antimicrobial resistance is a global problem directly related to inappropriate use. The limited information available on drug use pattern throughout the world indicated that drugs are not optimally used, where inappropriate use has serious health and economic consequences for individuals and community which negatively affects the success of national health care system. Rational antibiotic prescription is very important to avoid multiple drug resistance, treatment failure, non-compliance and increase in cost of treatment. Prescription analysis shows the way towards rational use of drugs. Irrational drug use

could also lead to ineffective, unsafe treatment and prolongation of illness, distress and harm to the patients. Based on result we conclude that, in paediatric department, Cephalosporins were the most frequently prescribed antibiotics. Percentage of prescribing by generic name was low and efforts to encourage prescribing by generic name should be initiated. WHO recommends lesser use of injection as it's helpful in reducing the cost of treatment and eliminate the pain to the patients. The active participation of clinical pharmacists in the clinical ward rounds and medication chart review can ensure rational prescribing of drugs and reduce the incidence of medication errors and adverse drug reactions. It will also reduce the cost of therapy which will ultimately benefit the patients. To conclude, our study suggests that strategies to control irrational use of antibiotics should be implemented and the guidelines used for treatment of paediatric patients should be upgraded periodically.

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