



# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Drug Utilization of Antimicrobials in Pediatrics Population at a Tertiary Care Hospital in Kancheepuram District of Tamilnadu, India

Mothilal M \*, Ramesh A, Thivya R, Damodharan N, Laksmi KS

Dept of Pharmaceutics, SRM College of Pharmacy, SRM.University, Kattankulathur-603203, Kancheepuram District, Tamilnadu, India

### ABSTRACT

Drug utilization is an essential part of Pharmacoepidmology and it describes the extent nature and determinants of drug exposure. The aim of the study was to evaluate drug utilization of antimicrobials in pediatrics at SRM medical college. A prospective cross sectional study was carried out for seven months, totally 109 prescription with antibiotics was collected the most commonly prescribed drugs were third generation cephalosporin's like ceftriaxone(27.9%), cefataxim(20.1%), followed by penicillin's ampicillin(12.9%),amoxicillin(12.9%), and there combinations and the highest reported diseases in pediatrics are broncholitis(24.9%), and acute gastro enteritis(22.0%).

**Key words:** drug utilization, pediatrics, antibiotics, cephalosporins.

*\*Corresponding author:*



## INTRODUCTION

The WHO 1997 defined Drug utilization as marketing, distribution, prescription, and use of drug in society with special emphasis on the medical social and economic consequences [1].

Antibiotics are the most commonly prescribed drugs in pediatrics they are the most susceptible to diseases than adults due to under developed immune system, hormonal imbalance, genetic factor and due to environmental changes, antibiotics are the drugs tend to prevent, inhibit (or) destroy life of micro organisms.

To use antibiotics in children's we have to consider pharmacokinetic and pharmacodynamics of the drugs ,Pharmacokinetics factors such as gestational and chronologic age are the factors to be consider when administering antibiotics to children because various organs mature at different rates as children grow, affecting the Pharmacokinetics, Pharmacodynamics of the drug play an important role in selection of antibiotic for pediatrics, knowledge about specific causative organisms and its susceptibility to different antibiotics is crucial. Early isolation of organism by obtain appropriate clinical sample for laboratory testing before beginning antibiotics therapy is ideal [2-5].

Center for diseases control (CDC) and prevention has given some recommendations to promote appropriate antibiotic use in children's and treatment guidelines for treatment of certain diseases in children,

The government of India has identified 90 antibiotics, which will included under the drugs and cosmetics act under schedule HX drugs of D and C act. Under this, 16 high antibiotics will not be available at drug stores any more. Drug manufacturing companies supply these drugs directly to tertiary care hospital. These antibiotics will carry red label declaring drugs for sale at tertiary care hospitals only

The present study is aimed to determine the drug utilization of antimicrobials in pediatrics in SRM MEDICAL COLLEGE AND RESEARCH CENTER in Tamilnadu, India.

## MATERIAL AND METHODS

A prospective cross-sectional study was conducted in SRM MEDICAL COLLEGE AND RESEARCH INSTITUE in the department of pediatrics, the study is a prospective cross sectional study approved by Institute Ethical Committee given with the reference number 201/IEC/2011, the Study was divided in to three phases: Phase I: (Pilot study) consists of preliminary study to identify the scope of work and to Determine various pediatric diseases. Phase II: consists of literature survey, preparation of data entry format. Phase III: consists of data analysis and identification of pattern of antibiotic use. About 109 patient are recruited for the study as per inclusion and exclusion criteria. The Inclusion criteria for recruiting the patients are the Patient of either sex with infection, And Patient with prophylactic antibiotics. Exclusion criteria for recruiting is the Patients age greater than ten years of age, and patients with congenital

abnormalities, Permission for collection of data is taken from the concerned physician in the pediatric ward was taken from Head of pediatric department before starting the study.

The data were collected in specially designed Performa, which contained patient demographics (age, sex and outcome of the patients), diagnosis, investigations, drug details and information from the prescriber regarding the indication for prescribing antimicrobial agent, suspecting organism underlying infection, duration of therapy and details of any concomitant medications and drugs were classified into different groups based on WHO-ATC classification and the diseases was classified based on center for diseases control (CDC)[6-8].

## RESULTS

Significant use of antimicrobials were observed in the conditions like bronchitis 24.7% (n=27) acute gastro enteritis 22% (n=22) followed by fever 21% (n=23), pneumonia and burns are 7.33% (n=8) ,urinary tractinfection 5.55%(n=6), meningitis, 2.75%(n=3) appendicitis 1.83% (n=2) and othersare3.6% (n=4). In pediatrics broncholitis (24.7%) and acute gastro enteritis (22%) and was found most common males than females in the age groups of six to eight.

### Route of administration

The highest route administration of antibiotics is through intravenous (50.68%) followed by oral route (17.8%) and both the route of administration (31.5%) aminoglycoside antibiotics which administered only through the intravenous route of administration..The results for the route of administration are shown in the table 1 [9].

Table 1: Route of administration

S.No.	Route	No. of cases (N=100)	Percentage
1.	IV	74	50.68%
2.	Oral	26	17.8%
3.	Both	46	31.5%

### Utilization of different dosage forms

A significant number of drugs were prescribed in pediatrics as tablet (45.8%) followed by injection (35.1%) syrup (12.2%) and suspension (6.7%), Ampicillin and amoxicillin are the drugs using in different dosage forms as tablet, injections, syrups and suspensions among the pediatrics. The results for utilization of different dosage forms are shown in Table number 2.

Table 2: Utilization of Different Dosage Form

S.No.	Dosage forms	No. of antibiotics	Percentage of antibiotics
1	Injection	82	44.08%
2	Tablet	63	33.87%
3	Syrup	22	11.82%
4	Suspension	12	6.45%
5	Ointments	7	3.76%

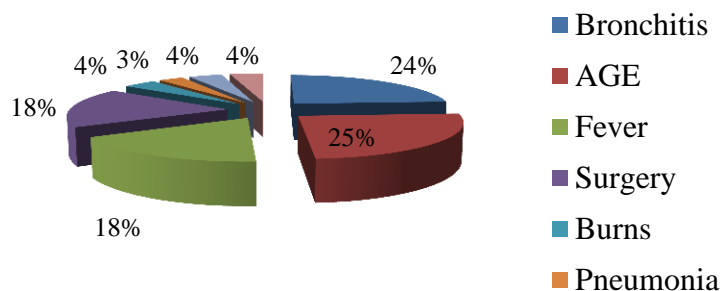
### Indication for which antibiotics prescribed

Third generation Cephalosporin's (48.69%) Ceftriaxone (27.9%) and Ceftaxim (20.1%) are the highest prescribing drugs and Pencillins (27.6%) Ampicillin (5.1%) Amoxicillin (12.9%) Amoxicillin + Clavalulnicacid (3.2%) Ampicillin +Claoxacillin (0.6%) are the second highest prescribing drugs among peditrics, followed by macrolides (12.49%) Azithromycin (10.3%), Erythromycin (3.2%) aminoglycosidic (8.55%) drugs like Amikiacin (8.4%) Oflaxacin (1.9%) and Other antibiotics for treatment of burns and scalds Bactriacin(1.9%),Neosporin(1.2 %), Silvaden (1.2%). Ceftrixone+Tazobactum (1.2%) the route of administration of antibiotic drugs are intravenous (50.6 %) oral (17.8 %) and both (31.5 %). The results are shown in table number 3.

**Table 3: Indications for Which Antibiotic Were Prescribed**

S. No.	ICD codes	Indication	No of patients
1	J20.0	Bronchitis	24
2	K52.2	AGE	25
3	R50.9	Fever	18
4	Z40.9	Surgery	18
7	T31.0	Burns	4
8	J18.0	Pneumonia	3
9	P39.3	UTI	4
10	Z72.9	others	4

The frequency of different types of antibiotics used for particular diagnosis Ceftaxim and Ampiciln are the highest prescribing drugs among peditrics followed by Ceftriaxone, Augmentin, and Amikaicin. In acute gastro enteritis is condition in which the highest prescribing antibiotic was cefataxim. Ceftrioxone is the third generation cephalosporin antibiotics prescribed most commonly for fever. Parental Ceftrixone is the prophylactic antibiotic prescribing for surgery cases, burns are seen most commonly at growing stages in peditrics the antibiotics prescribed in burn are Ampiillin, Amoxicillin and Ampiclox for treatment of infections and antibiotic ointments like Bactriacin, Sivaden, neomycin the antibiotics given in pneumonia and urinary tract infection are Ceftrixone, Amoxicillin and Ampicillin the results are tabulated in Table 7. And the results are shown inform of pie diagram in the figure.1



**Figure 1: Indications for Which Antibiotic Were Prescribe**

**Table 7: Frequency of usage of different type of antibiotics**

Diagnosis	Ceftriaxone	Ceftaxim	Ampicillin	Amikacin	Amoxicillin+ Clavulanic acid	Ofloxacin	Amoxicillin	Azithromycin	Erythromycin	Ampicillin + Cloxacillin	Bactricin	Neosporin	Sivaden
Bronchitis	5	6	6	4	5	3	2	-	-	-	-	-	-
AGE	2	13	-	7	-	2	2	-	-	-	-	-	-
Fever	13	5	-	6	-	-	6	-	-	-	-	-	-
Surgery	13	6	-	-	7	-	-	-	-	-	-	-	-
Burns	-	-	1	-	-	-	1	-	-	2	3	2	2
Pneumonia	2	-	-	-	-	-	2	2	2	-	-	-	-
UTI	4	-	1	2	1	-	1	1	1	-	-	-	-
others	2	-	1	1	-	-	2	-	2	1	-	-	-

**Distribution of drug in single drug and fixed dose combination**

The highest number of antibiotics contain single drug (72.97%) and the antibiotics contain two active ingredients (3.93%) are only three drugs. The distribution of drugs is shown in the number Table 4.

**Table 4: Distributions of drugs in single drug and fixed dose combinations**

S.No.	Drugs	No of drugs
1.	Single drug	72.97%
2.	Combination drugs	3.93%

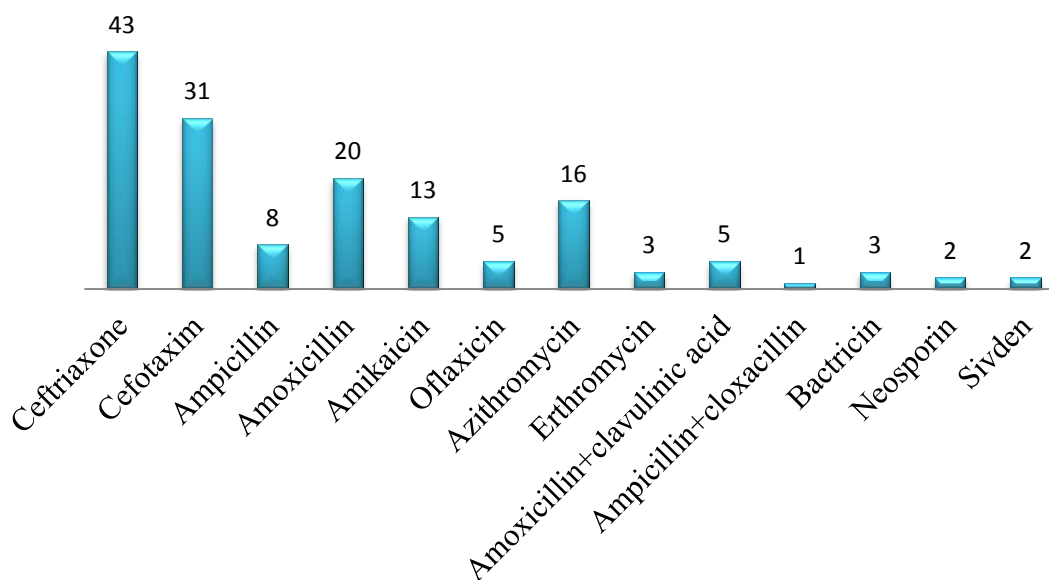
**Antibiotic Usage Pattern**

Ceftriaxone (28.3%) and Cefataxim (20.39%) are the highest prescribing drugs, Ampicillin (10.52%) amoxicillin (13.15%) Amoxicillin + Clavalulenicacid (3.28%) Ampicillin + Cloxacillin (0.65%) are the second highest prescribing drugs among pediatrics, followed by Azithromycin (10.52%), Erythromycin (1.97%) Amikiacin (8.55%) Ofloxacin (3.28%) and other antibiotics for treatment of burns and scalds Bactricin (1.97%), Neosporin (1.31%), Silvaden (1.31%).

The details of drugs was classified into groups based on who anatomical therapeutical classification of drugs given with ATC codes. The antibiotic usage pattern is shown in table 5 the tabulated results are shown as bar diagram in the figure 2.

**Table 5: Antibiotic Usage Pattern**

S. No.	ATC code	Name of antibiotics	No of patients	Percentage usage
1	JO1DD04	Ceftriaxone	43	28.28%
2	JO1DD01	Cefotaxim	31	20.39%
3	JO1CA01	Ampicillin	8	10.52%
4	J01CA04	Amoxicillin	20	13.15%
5	J01GB06	Amikaicin	13	8.55%
6	J01MA01	Oflaxacin	5	3.28%
7	J01FA10	Azithromycin	16	10.52%
8	J01FA01	Erythromycin	3	1.97%
9	J01CR02	Amoxicillin+clavulinic acid	5	3.28%
10	J01CA51	Ampicillin+cloxacillin	1	0.65%
11	D06AX05	Bacitracin	3	1.97%
12	A07AA01	Neosporin	2	1.31%
13	D06BA01	Silvadene	2	1.31%



**Figure 2: Antibiotic Usage Pattern**

**Average number of antibiotics per prescription:**

A total of 152 antibiotics were prescribed to 100 patients a highest percentage of patient (63%) were prescribed with one antibiotic (29%) were prescribed with two antibiotics 7% were prescribe with three antibiotics and 1% of patient prescribed with five antibiotics, (Table 6) and the antibiotics containing single active ingredient is (72.97%) and the drug with two active ingredients are (3.29%).the average number of antibiotics per prescription was shown in table 6 [10].

### Frequency of usage of different types of antibiotics

Cephalosporins (48.69 %) are the highest prescribing drugs in which third generation cephalosporins, Ceftriaxone (28.3%) and Cefataxim (20.39%) are commonly prescribing drugs in pediatrics. Pencillins (27.6%) are the second highest prescribing drugs among the pediatrics Ampicillin (10.52%), Amoxicillin (13.15%) Amoxicillin + Clavalulenicacid (3.28%) Ampicillin +Claoxacillin (0.65%) are most commonly prescribed drugs among pediatrics, Amoxicillin is the highest prescribing drug among pencillins in different dosage forms such as tablet, syrup, suspension. Followed by macrolides (12.49) Azithromycin (10.52%), Erthromycin (1.97%), Aminoglycosides Amikiacin(8.55%), Flouroqunilone Oflaxacin (3.28%) and Other antibiotics for treatment of burns and scalds Bactricin (1.97%), Neosporin (1.31%), Sivaden (1.31%), the frequency of antibiotic usage for particular diagnosis was shown in the Table 7 and the tabulated results are shown in the form of pie diagram in the figure 3.

Specimens taken from pediatrics is blood (35.7%), urine (14.28%), pus (21.42%) and sputum (28.57%) most of the specimens taken for isolation does not report an organism only two specimen of urine reported *E.coil* and specimen of sputum shown *K.pneмония* presence [11].

**Table 6: Average Number of antibiotics per prescription**

S. No.	No. of antibiotics	Percentage of patients
1	1	63%
2	2	29%
3	3	4%
4	5	1%

**Table 8: Percentage of Usage of different types of antibiotics**

S. No.	Class of antibiotics	Percentage of antibiotics
1.	Pencillins	27.6 %
2.	Cephalosporins	48.69 %
3.	Aminoglycosides	8.55%
4.	Macrolides	12.49%
5.	Flouroqunilone	3.28%
6.	Others	4.59%

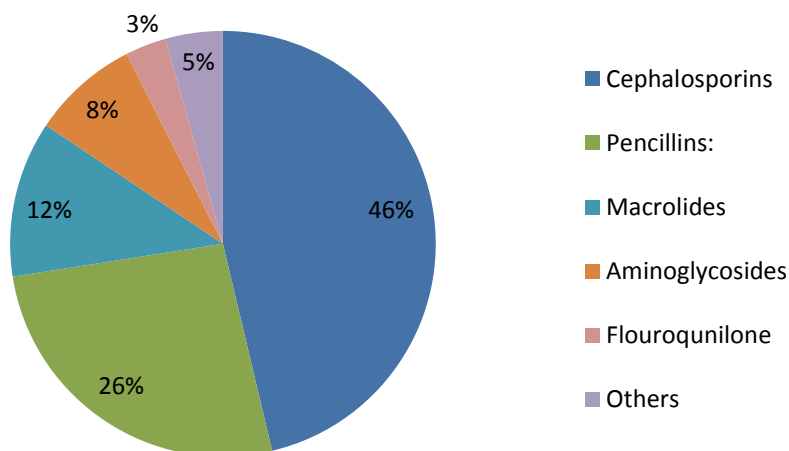


Figure 3: Percentage of Usage of Different Types of Antibiotics

### DISCUSSION

The present study is Drug Utilization of Antimicrobial Drug in Pediatrics Population in SRM Medical College Hospital and Research Center in Kattankulathur, Tamilnadu, India, Drug utilization is an essential part of pharmacoepidmology and it describes the extent nature and determinants of drug exposure [12].

Irrational use of antibiotics causing a economic burden on health care system. Over prescribing is associated with increase resistance in organism leads to non responsiveness of microorganisms.

GARP(global antibiotic resistance partnership) –India reported that pneumonia causes an estimated deaths of 410,000 deaths in India and it is number one killer of children’s many of deaths occur because the patients do not have access to life saving antibiotics [13].

In this study out of 121 prescriptions The highest prescribed antibiotics were third generation cephalosporin’s (48.69%) such as Ceftriaxone (28.3%) and Cefataxim (20.39%) which are active against gram negative organisms including some are active against *P.aeruginosa*. Cephalosporin’s are generally well tolerated orally administered cephalosporin’s may cause gastrointestinal complaints in this study three patient suffered with diahbroea and one patient with vomiting.

The second highest prescribed drugs were Penicillin’s (27.6%) drugs like amoxicillin (13.15%) Ampicillin (110.52%) and there combinations (3.93%) amoxicillin and Ampicillin are aminopencillins were active against gram negative strains, amoxicillin is well absorbed orally than Ampicillin. Different approach with combinations like Amoxicillin + Clavulinicacid to counteract beta lactase produced by Bactria.



Amikacin only drug prescribing in pediatrics in aminoglycosides which is not available for oral administration so they are mainly used in the form of parenteral amino glycosides are the concentration dependent antibiotics their bactericidal effect depends on the adequate peak concentration.

Macrolides (12.49%) are the antibiotic drugs which work by inhibit RNA dependent protein synthesis by reversibly binding to the 50S ribosomal subunit of susceptible microorganism erythromycin was commonly used as an alternative therapy for penicillin allergic children's new macrolides for use in children's include Azithromycin and Clarithromycin they are used for treatment of respiratory tract infections.

Fluoroquinolones (3.28%) are bactericidal agents that are derivatives of nalidixic acid. they are inhibitors of DNA replication by binding to the topoisomerases of their target Bacteria. Ciprofloxacin is the only quinolone approved for use in children's. The fluoroquinolones in children should be limited to patients who have cystic fibrosis so the fluoroquinolones are the least prescribed drugs prescribed in this Study, Silvaden, neomycin and Bacitracin are the antibiotic ointment used in treatment of burns.

Pediatrics is the department it is very essential to Some steps to be taken to regulate antibiotic use in children's by increasing vaccination programmes into universal immunization programme, adapting standard guide lines for treatment of viral and bacterial disease regulations to use antibiotics in pediatrics [14].

## CONCLUSION

Only few antibiotics have been studied adequately for safety and effectiveness for use in children's unfortunately data regarding antibiotic pharmacokinetics, efficiency, are often extrapolated from the studies of performed in adult (or) animal for dosage regimen in children the USFDA (1999) address the issue with the pediatric rule, Two recent laws were reauthorized in 2007, the **pharmaceutical act for children act** and **pediatric research equity act**.

Qualitative and quantitative parameters of antibiotics used for treating diseases should have direct relation to frequency of infectious diseases, and seriousness of the patient Analysis of prescription and drug utilization are from the base of pharmacoepidmiological study which specifies the therapeutic value of medication for target population after adaption into therapy.

## REFERENCES

- [1] Donald Birkett, Folke Sjoqvist, Chapter 10 drug utilization. [http://www.iuphar.org/pdf/hum\\_76.pdf](http://www.iuphar.org/pdf/hum_76.pdf). Accessed on 9 December, 2010.
- [2] Bergman U et al., eds. Studies in drug utilization. Methods and applications Introduction to Drug Utilization Research by WORLD HEALTH ORGANISATION 2003; 4: 213-224.



- [3] Alexander Bykov and Thomas Moore. Guidelines for implementing drug utilization review Programs in hospitals, 1997; 1515:1-58.
- [4] Adithya H Gaur, B Keith. Indian J Pediatr 2006; 73: 343-345.
- [5] Ana Paula Simons. Rev Bras Epidemiol 2009; 12(3): 1-11.
- [6] Moorthi C, Rachel Paul P, Srinivasan A. Int J Pharm Pharm Sci 2009; 3(3): 171-177.
- [7] Folk Sjoqvist and Donald Birkett. Drug Utilization 2003; 10: 1-9.
- [8] Shamsy K, Mufida Begum L, Perumal P. Int J Pharm Tech Res 2011; 3: 1530- 1536.
- [9] Hanmantamane and Priyadarshini. Int J Pharm Bio Sci 2011; 2: 314-319.
- [10] Jozef V Kolar, Radka. J Chin Clin Med 2007; 2: 314-319.
- [11] Marie France de La Cochetière, Carole Rougé, Dominique Darmaun. Curr Pediatr Rev 2007; 3: 21-34.
- [12] Potocki M, Goette J, Szucs TD, Nadal D. Infection 2003; 31:391-403.
- [13] Mora Y. Int J Infect Dis 2008; 2: 211-220.
- [14] Nirmal K. Indian J Med Res 2011; 134: 281-294.