Original Article

An Assessment of Antibiotic Drugs Utilization Pattern in Paediatric Population

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ABSTRACT

Background: The study is to improve the quality of prescribing and may help in overcoming the problems associated with irrational use of antibiotics. **Aim:** To evaluate antibiotic drugs utilisation in paediatric population. **Methods:** A prospective observational study was conducted in paediatric department in a tertiary care teaching hospital for a period of 6 months. All the patients who were prescribed with any of antibiotic drug therapy were included in the study and reviewed. **Results:** Prescribing pattern was observed in 600 subjects during the study period. Antibiotics were prescribed for various conditions like bronchopneumonia (23.16%), viral pyrexia (16.16%), lower respiratory tract infection (10.16%), seizures (8.16%), acute gastroenteritis (7%) and other conditions (35.33%). In the included paediatric population, children's were more prone to infections followed by neonates. In our study most frequently used antibiotic drugs were ampicillin, amikacin, cefotaxime, ceftriaxone and amoxiclav. Most often prescribed dosage forms of antibiotic drugs were injection (82%), syrup (10%), tablet (7%) and capsule (1%). To identify pathogenic organisms, specimens were collected from 56 (9.33%) of subjects. Commonly used specimens were serum 16 (28.57%), sputum 24 (42.85%), cerebrospinal fluid 7(12.5%) and other specimens 9 (16.07%). The number of drugs prescribed was found to be with a minimum of 2 and maximum of 5 antibiotic drugs. **Conclusion:** The treatment regimen given in most of the cases was without performing any culture sensitivity test which may lead to irrational use of antibiotics. Antibiotic resistance leads to a decrease in treatment success, which results in increased morbidity and mortality.

Key words: Antibiotic drugs, Paediatric, Prescribing pattern, Rational drug use, Drug utilization evaluation.

INTRODUCTION

Antibiotics are one of the oldest discovered drugs that combat specific microorganisms like bacteria and fungi. These substances are produced by microorganisms, which at low concentration kill the other microorganisms.[1] In paediatrics; antibiotics are mostly prescribed as they have higher rates of infections and due to their immature immunity and susceptibility to bacterial infection.[2]

Infections such as diarrhoea, upper respiratory tract infections, acute respiratory tract infections and viral fever are caused by viruses and the large volumes of antibiotics are prescribed.[3,4] The rational use of drugs means patients receive medications appropriate to their clinical needs, adherence and drug availability in adequate dose for the sufficient duration of time.[5,6] Antibiotics start combating an infection within few hours of time, but it is also important to complete the whole course of antibiotics to prevent the return of the infection. Stopping the medication before the course has finished increases the risk that the bacteria will become resistant to future treatments.[7] Common side effects of antibiotics are vomiting, nausea, diarrhoea, bloating and indigestion, abdominal pain, loss of appetite and allergic reactions.[8] Before starting antibiotic treatment, the paediatrician should ask if appropriate sample have obtained for culture or other microbiological investigations, when indicated in order to establish the specific microbiological diagnosis.[9] There is vast number of laboratory tests that helps in identify the organism. The tests are broadly

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divided into indirect and direct non-culture based and culture based tests, Nucleic Acid Amplification Tests (NAATs), White Cell Count test (WCC), C-reactive Protein (CRP) and also Point of Care (POC) tests.[10]

Antibiotics are not suitable drugs for viral infections. Antibiotics cannot kill viruses as result of viruses have completely different structures and replicate in a very different method than bacteria. Antibiotics cannot destroy viruses as a result of the specifically target the machinery found in bacteria. Since viruses don't contain any of this machinery, the antibiotic doesn't have a target to attack.[11] Antibiotics for the viral infection is highly misused medicine. The standard of treatment needs prescribing to be acceptable, safe and effective and therefore the aim is to realize clinical profit.[12]

Antibiotic consumption is directly related to the antibiotic resistance rates of common bacteria.[13] Antibiotics are usually against the bacterial growth, but when the microbes become less sensitive or resistant, higher concentration of same drug is needed to have an effect.[14] Antibiotic resistance occurs when a drug loses its ability to inhibit bacterial growth effectively.[15] Antibiotic resistance leads to a decrease in treatment success, which results in increased mortality and morbidity.[16]

The main aim of the study is to evaluate the prescribing pattern of antibiotics in paediatric department of MGM Hospital located in Warangal, Telangana, India. The significance of the study is to improve the quality of prescribing and may help in overcoming the problems associated with irrational use of antibiotics. To optimize antibiotic therapy, by promoting rational use of antibiotics, dosing, route and duration of therapy in order to improve clinical care or prevent infections.

MATERIALS AND METHODS

Study design

This is a prospective observational study which was conducted for 6 months in Department of Paediatric, in Mahatma Gandhi Memorial Hospital, Warangal, Telangana, India.

Inclusion criteria

All the patients who were prescribed with antibiotics in the paediatric ward were included in the study. Patient's both genders, age 0-12 years were included.

Exclusion criteria

The paediatric out patients and age above 12 years were excluded.

Methods

The study protocol and informed consent was reviewed and approved by institutional ethical committee MGM/VCOP/PHARMD/V/019/2017. Informed consent was obtained from all the care takers of patient by explaining them in their language about the process of work. Study was divided in to three phases. Phase-1: primary study to identify the outlook of work and to conclude various paediatric diseases, Phase-2: literature review, preparation of data entry format and collection of cases and Phase-3: data analysis and identification of plan of antibiotic use.

A total of 600 cases were studied in paediatric inpatient department, which has complete information as per inclusion criteria. The relevant data were collected in specially designed proforma, which contained patient demographics, diagnosis, investigations, drug details and information from the prescriber regarding the indication for prescribing antibiotic agent, suspecting organism underlying infection, duration of therapy.

Statistical analysis

The data was subjected to descriptive analysis using Microsoft Excel.

RESULTS

Basic demographic data

Figure 1 reveals a total of 600 patients were enrolled from paediatric department. Majority of the study subjects who participated in the study were belonging to the age group of children (2-12 years) 328 followed by infants (1 month – 2 years) 268 and neonates (0-30 days) 04.

Figure 2 shows the more number of males 347 (57.10%) was found to be effected to infections as compared to females 253 (42.90%).

Frequency of antibiotics used for particular indication and duration of antibiotic therapy

Table 1 shows out of 600 cases, patients with different conditions such as acute gastroenteritis, bronchopneumonia, lower respiratory tract infection, seizures and other diseases were enrolled. Out of all the subjects commonly observed clinical conditions were bronchopneumonia 139 (23.16%), lower respiratory tract infections 61 (10.16%), viral pyrexia 97 (16.16%), seizures 49 (8.16%), acute gastroenteritis 42 (7%) and other conditions 212 (35.33%). Number of antibiotics prescribed for different indications and duration of therapy was shown in days.

Table 2 shows that frequency and cumulative frequency,

Table 1: Frequency of antibiotics used forparticular indication and duration of antibiotic therapy.

Sl. No.	Disease	Number of patients	Percentage of disease	Number of antibiotics used			Duration of antibiotic therapy (in days)			
				1	2	>2	1-3	4-6	7-9	>10
1	AcuteGE	42	7%	21	16	5	7	20	10	5
2	Acute GN	10	1.66%	9	0	1	0	7	3	0
3	Anaemia	21	3.5%	11	4	6	6	7	5	3
4	Asthma	7	1.16%	2	3	2	1	3	2	1
5	Bronchiolitis	13	2.16%	8	3	2	4	2	3	4
6	Bronchopneumonia	139	23.16%	9	99	31	25	65	40	9
7	LRTI	61	10.16%	16	31	14	15	28	8	10
8	Malaria	14	2.33%	9	3	2	5	4	2	3
9	Meningitis	11	1.83%	0	9	2	5	0	2	4
10	Seizures	49	8.16%	29	17	3	25	15	2	7
11	Septicaemia	22	3.66%	1	15	6	5	5	7	5
12	URTI	18	3%	9	6	3	4	11	2	1
13	UTI	24	4%	12	10	2	3	10	8	3
14	Viralpyrexia	97	16.16%	30	47	20	26	36	25	10
15	Other diseases	72	12%	22	28	22	13	26	18	15
	Total	600	100%	188	291	121	144	239	137	80

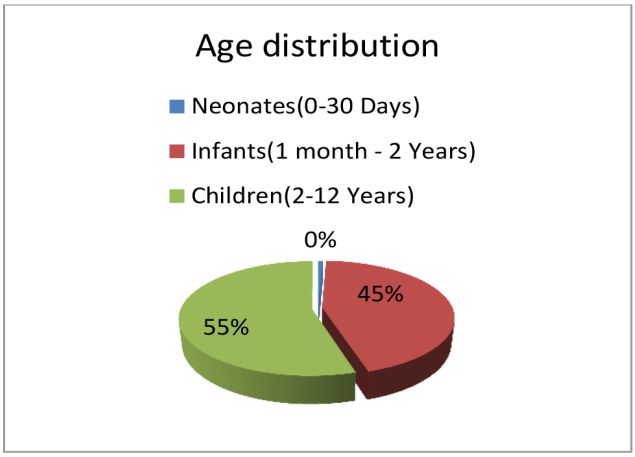

Figure 1: Distribution of age groups.

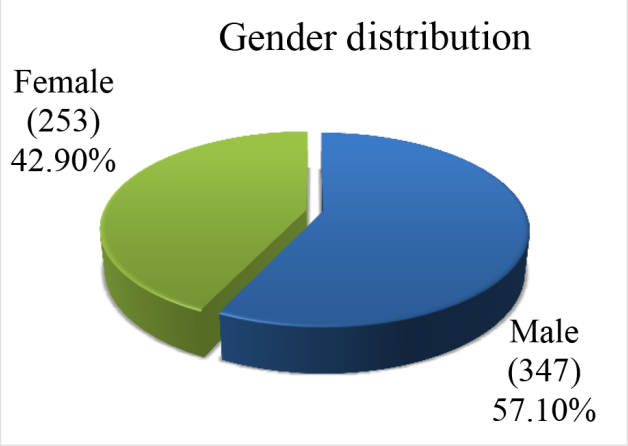

Figure 2: Gender wise distribution of paediatric population.

Table 2: Duration of therapy of paediatric patients.

Duration of therapy (in days)	Frequency	Percentage (%)	Cumulative Frequency	Cumulative Percentage (%)
1 - 3	144	24	144	24
4 - 6	239	39.83	383	63.83
7 – 9	137	22.83	520	86.66
>10	80	13.33	600	100

percent and cumulative percent of the patient's duration of therapy. Patients were administered antibiotics for an duration of 4-6 days in 239 subjects, 1-3 days in 144 subjects, 7-9 days in 137 subjects and more than 10 days in 80 subjects.

Figure 3 reveals that Antibiotics can be given as single drug or in a combination therapy. Our study shows many of subjects were prescribed with two antibiotics in 297 subjects, more than two antibiotics in 121 subjects and a single or 1 antibiotic prescribed in 188 subjects.

Number of antibiotics prescribed and dosage form

Table 3 shows that out of 600 subjects, majority of patients were prescribed with ampoxin 327 (30.11%), amikacin 241 (22.19%), cefixime 165 (15.19%), ampicillin 111 (10.22%), Ceftriaxone 99 (9.11%), cephalexin 47 (4.32%) and other antibiotics 96 (8.86%) and shows the different types of dosage form prescribed.

Table 3: Number of antibiotics prescribed and dosage form.

Sl. No	Name of antibiotic	Number of patients	Percentage of drugs	Dosage form			
				Injection	Syrup	Tablet	Capsule
1	Albendazole	9	0.82%	0	5	4	0
2	Amikacin	241	22.19%	241	0	0	0
3	Amoxicillin	7	0.64%	0	5	0	2
4	Ampicillin	111	10.22%	7	69	35	0
5	Ampoxin	327	30.11%	327	0	0	0
6	Azithromycin	28	2.57%	28	0	0	0
7	Cefotaxime	7	0.64%	2	1	4	0
8	Cefixime	165	15.19%	164	1	0	0
9	Cephalexin	47	4.32%	3	28	16	0
10	Ceftriaxone	99	9.11%	99	0	0	0
11	Clindamycin	8	0.73%	3	0	2	3
12	Erythromycin	14	1.28%	0	0	14	0
13	Metronidazole	14	1.28%	12	1	1	0
14	Streptomycin	3	0.27%	4	0	0	0
15	Vancomycin	3	0.27%	3	0	0	0
16	Other drugs	3	0.27%	0	1	2	0
	Total	1086	100%	893(82%)	110(10%)	78(7%)	5(1%)

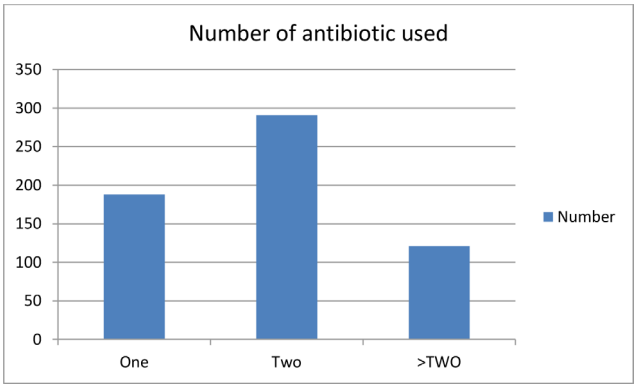

Figure 3: Number of antibiotics prescribed.

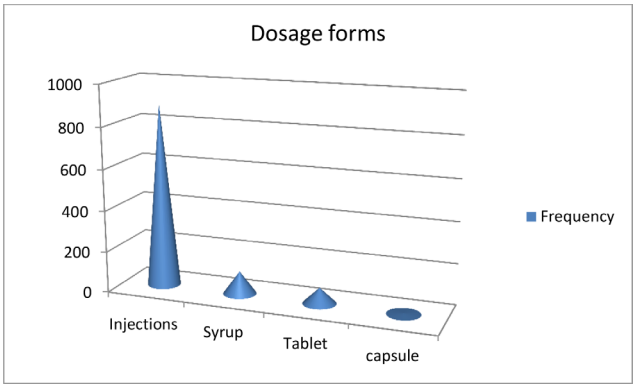

Figure 4: Dosage Forms.

Table 4 reveals the class of antibiotics prescribed. Majority of the subjects were prescribed with penicillins 445 (40.97%), cephalosporins 318 (29.28%), aminoglycosides 244 (22.46%) followed by Macrolides 50 (4.60%) and others 29 (2.67%).

Figure 4 reveals that a different types of dosage forms, among that, injections 893(82.13%) are more commonly used dosage forms than syrups 110 (10.12%) followed by tablets 78 (7.18%) and capsules 05 (0.46%).

Number of Specimens taken for culture sensitivity test

Figure 5 shows the Out of 600 cases, specimens were collected for culture test in only 56 patients to identify pathogenic organisms as serum 16 (28.57%), urine 4 (7.14%), sputum 24 (42.85%), stool 5 (8.92%) and

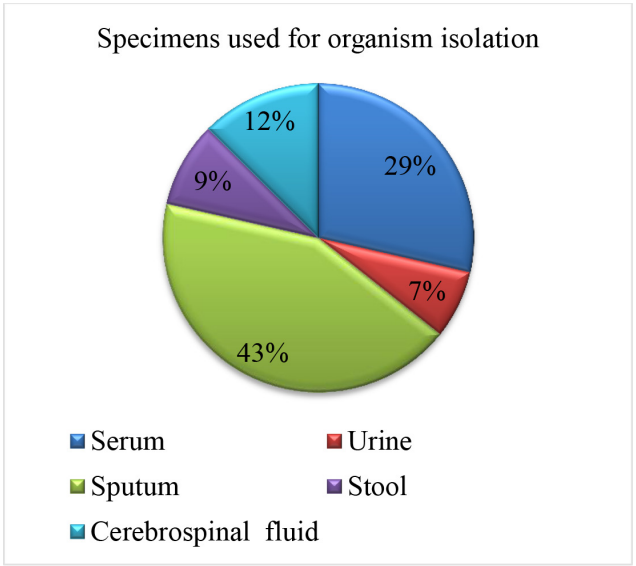

Figure 5: Specimens used for organism isolation.

Table 4: Class of antibiotics prescribed in paediatric patients.

Antibiotic Class	Frequency (N)	Percentage (%)
Penicillin	445	40.97
Cephalosporin	318	29.28
Aminoglycosides	244	22.46
Macrolides	50	4.60
Nitroimidazoles	23	2.11
Glycopeptides	3	0.27
Other drugs	3	0.27
Total	1086	100

Table 5: Culture report of the patients.

Culture report	Frequency	Percentage (%)	Cumulative Frequency	Cumulative Percent (%)
Positive	20	35.71	20	35.71
Negative	36	64.28	56	100

cerebrospinal fluid 7 (12.5%) samples. Preferably serum and sputum were collected in large numbers.

Table 5 shows the culture report of the patients in frequency, cumulative frequency and percent and cumulative percent. Out of 600 patients, specimens were collected for culture report in only 56 patients. From the above data 20 specimens showed positive result and 36 specimens showed negative result.

DISCUSSION

Antibiotics are commonly used for the treatment of bacterial infections. The reviewing of the prescription and rational prescribing of the drugs is necessary to improve the therapeutic efficacy and to decrease the adverse effects of the drugs.

Six hundred patients were enrolled in the study where 347 male patients and 253 female patients. Which was similar to study performed in Coimbatore by Chitra *et al*.[17] the study on gender categorization had revealed that the overall study population was predominantly male population.

In our study majority of antibiotics received patients belong to the age group of children (2-12 years) followed by infants (1 month - 2 years) and neonates (0-30 days). This was supported by the study conducted in Gujarat by Sondarva *et al*.[18] who concluded that out of 255 patients enrolled, the majority of patients were 5 years.

Out of 600 cases majority of the patients were diagnosed with bronchopneumonia 139 (23.16%), viral pyrexia 97 (16.16%), lower respiratory tract infection 61 (10.16%), seizures 49 (8.16%), acute gastroenteritis 42 (7%) and other conditions 212 (35.33%). The longest duration of antibiotic therapy was observed for 4-6 days and shortest was for 7-9 days. This was comparable to the study conducted in Kingdom of Saudi Arabia by Kousalya *et al*.[19] where majority of children were diagnosed with enteric fever and urinary tract infection (21%), followed by upper respiratory tract infection (18%). The mean value of hospitalization length in children with prescribed antibiotics was 5 days.

Most frequently prescribed antibiotics for empirical therapy were penicillin's 445 (40.97%), aminoglycosides 244 (22.74%), cephalosporin's 318 (29.28%) and Macrolides 50 (4.60%) and other antibiotics 29 (2.67%). This was slightly to similar to the study conducted in Egypt, Mona *et al*.[20] who concluded that the most frequently prescribed antibiotics for empirical therapy were quinolones (45%), followed by broad spectrum penicillin's (25%) and cephalosporin's (10%).

Majority of the patients were prescribed with ampoxin (ampicillin + cloxacillin) 327 (30.11%), amikacin 241 (22.19%), cefixime 165 (15.19), ampicillin 111 (10.22%), ceftriaxone 99 (9.11%) followed by cephalexin 47 (4.32%) and other antibiotics 96 (8.86%). This study was similar to the study conducted in guwahati by choudhury *et al*.[21] where maximum number of antibiotics prescribed were amoxicillin + clavulanic acid 35%, followed by ceftriaxone 29%, amikacin 17%, Cefotaxime + sulbactum 12%, Vancomycin 2% and tobramycin 1%.

Patients who were prescribed with two antibiotics were about (48.5%) patients, one antibiotic were prescribed in (31.33%) patients and greater than two antibiotics were prescribed in only (20.16%) patients. This data is complementary to the study done in Tamil Nadu by Shamshy *et al*.[22] where majority of patients (54.58%) were prescribed at least one antibiotic, two antibiotics were prescribed in (28.57%), three antibiotics were prescribed in (15.02%) and four antibiotics were prescribed in only (1.83%) cases.

Frequently used dosage forms of antibiotics were as injections 893(82%), syrups 110(10%), tablets 78 (7%) and capsules 5 (1%). This study is identical to the three studies carried out by Mona *et al*. Chitra *et al*. and Megha *et al*.[23]

On the basis of data evaluation 91% of antibiotic prescriptions were treated on a clinical basis, without performing any microbiological tests, this is supported by

study conducted in Kingdom of Saudi Arabia by Kousalya Prabahar *et al.* over 50% of antibiotic prescriptions were started on a clinical basis, without confirmation of a bacterial infections.

Over 600 patients clinically diagnosed with infectious diseases, treated with antibiotics, specimens were taken for culture test in only 56 patients for identification of pathogenic organisms' sputum (43%), serum (29%), cerebrospinal fluid (12%), stool (9%) and urine (7%). among 56 specimens only 20 specimens showed positive result and 36 specimens showed negative result. Which was similar to study done in Tamil Nadu by Shamshy *et al.* for detection of organisms, specimens were collected in only 14 cases out of 273 patients. Patient's blood culture was 2.56%, sputum 0.73%, urine 1.46% and other pus 0.37%. In those only six specimens showed positive culture result.

CONCLUSION

Antibiotic prescribing pattern was effective in most of the subjects. The report on sensitivity pattern was helpful to select the appropriate antibiotics to patient. The rational use of antibiotics is one of the main contributes to control worldwide emergence of antibiotic resistance and side effects. The study concludes that the treatment regimen given in most of the cases is without performing any culture sensitivity test which may lead to irrational use of antibiotics and develop resistance. In most cases children were admitted very sick and clinicians justify empirical antibiotics in such suffered life-threatening infections.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

ABBREVIATIONS

NAATs: Nucleic Acid Amplification Tests; **WCC:** White Cell Count; **CRP:** C-Reactive Protein; **POC:** Point of Care; **Acute GE:** Acute Gastroenteritis; **Acute GN:** Acute Glomerulonephritis; **LRTI:** Lower Respiratory Tract Infection; **URTI:** Upper Respiratory Tract Infection; **UTI:** Urinary Tract Infection

SUMMARY

The main challenges in prescription of antibiotics are to achieve a rational and appropriate use of antibiotics and to recognize their potential side effects. Empirical therapy and antibacterial usage for viral infection can be reduced by the availability of rapid diagnostic method to differentiate between viral and bacterial infection.

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