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## Original Article

### TO INVESTIGATE THE PRESCRIPTION PATTERN OF ANTIMICROBIAL DRUGS USED IN MEDICAL INTENSIVE CARE UNIT OF EDUCATING HOSPITAL IN HYDERABAD

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## ABSTRACT

Antimicrobial medications are the greatest contribution, which are used for cure and prevention of infections. Extensive utilization of antimicrobials has simplified the growth of resistance. The study was to assess the use of antimicrobials in tertiary care hospital in Hyderabad Prescription audit was done to assess the use of antimicrobials. Total 252 prescriptions were analyzed for mean number of medications prescribed, antimicrobials prescribed by generic name or brand name, % of antibiotics among the prescribed medications, utilized of fixed medicine combinations, if any. Statistical analysis used: Data was analyzed by percentage. Demographic examinations showed that out of 252 patients in OPD, most were male 142 and in the age group between 35 to 50 years. In 252 prescriptions, 187 medications were antimicrobials. Three medicines were advised in 6.08% of the prescription, followed by 4 medications in 9.52 % prescriptions. 79.18% prescriptions were advised by generic name while 20.82% were advised by brand name. 29.18% of medications were fixed dose combinations of all the antibiotics were advised empirically on the basis of provisional diagnosis. Of the total of antibiotics advice, amoxicillin was advised in 50.66% of sufferers, followed by cotrimoxazole in 26.05 % sufferers, cephalexin (8.50%) were used usually. The rational utilization of antimicrobial product is one of the main contributors to control worldwide emergence of antibacterial resistance, SEs and decreased cost of the therapy.

**Key Words:** Antimicrobials. Prescription, Anatomical Therapeutic Classification (ATC)...

## 1. INTRODUCTION

The word antimicrobial was derived from the Greek words anti (against), mikros (little) and bios (life) and refers to all agents that act against microbial organisms. This is not synonymous with antibiotics, a similar term derived from the Greek word anti (against) and biotikos (concerning life). By strict definition, the word “antibiotic” refers to substances produced by microorganisms that act against



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another microorganism. Thus, antibiotics do not include antimicrobial substances that are synthetic (sulfonamides and quinolones), or semisynthetic (methicillin and amoxicillin), or those which come from plants (quercetin and alkaloids) or animals (lysozyme). Antibiotics Versus Antimicrobials An antibiotic is a low molecular substance produced by a microorganism that at a low concentration inhibits or kills other microorganisms. An antimicrobial is any substance of natural, semisynthetic or synthetic origin that kills or inhibits the growth of microorganisms but causes little or no damage to the host. All antibiotics are antimicrobials, but not all antimicrobials are antibiotics. In contrast, the term “antimicrobials” include all agents that act against all types of microorganisms – bacteria (antibacterial), viruses (antiviral), fungi (antifungal) and protozoa (antiprotozoal). Notice that the term “antibacterial”, being the largest and most widely known and studied class of antimicrobials, is often used interchangeably with the term “antimicrobials” and will be the major focus of this website.

Depending on the range of bacterial species susceptible to these agents, antibacterial are classified as broad-spectrum, intermediate-spectrum, or narrow- spectrum. Note that the spectra of activity may change with acquisition of resistance genes, as will be discussed in the next module. 1. Broad spectrum antibacterial are active against both Gram-positive and Gram-negative organisms. Examples include: tetracyclines, phenicols, fluoroquinolones, “third-generation” and “fourth-generation” cephalosporins. 2. Narrow spectrum antibacterial have limited activity and are primarily only useful against particular species of microorganisms. For example, glycopeptides and bacitracin are only effective against Gram-positive bacteria, whereas polymyxins are usually only effective against Gram negative bacteria. Aminoglycosides and sulfonamides are only effective against aerobic organisms, while nitroimidazoles are generally only effective for anaerobes.

The study was to assess the use of antimicrobials in tertiary care hospital in Hyderabad. To evaluate the number of drugs prescribed per prescription and to evaluate the most commonly prescribed the frequency of systemic infection in 6 months

## 2. EXPERIMENTAL SECTION

### Study Design:

A retrospective , observational study. Study Duration: 8 months from Nov 2016 to July 2017 Study Population:

Medical Record (MR) data were recorded from MRD department; consisting of prescription reports of 252 sufferers that admitted in the internal medicine and surgery in prime Hospital, Ameerpet Hyderabad. Procedure: The trail was performed after the permission from the Institutional Ethics Committee. Total 327 sufferers' data were screened and examined as per the including and excluding criteria and 252 sufferers were selected for this trail. Sufferer related information like age, gender, diagnosis, month of admission, drug related information like no. of medicines prescribed were gathered on a customized data collection sheet.

### Including criteria:

1. Age between 10 and 65 years
2. All sufferers who were admitted in the IPD of the Medicine and Surgery departments and were prescribed on the antimicrobials for various infections.
3. Subjects who are ready to sign ICFs
4. Patients who are admitted in ICU for Chronic Diseases like Ischemic Heart disease etc..

### Excluding criteria:

1. Patients with incomplete data
2. Patients with age below 10 years
3. Case records of patients who got transferred to other speciality Intensive Care Units or another ward or discharged within 24 hours of admission were excluded from the study.

### Variables studied:

Following parameters were taken in the trail

1. Average No.of antimicrobials prescribed per prescription.
2. Percentage use of different antimicrobials
3. Percentage use of medicines in each antimicrobial group
4. Prevalence of systemic infection at various months

5. Relationship between sufferer’s demographics and prescription pattern

**Statistical analysis:**

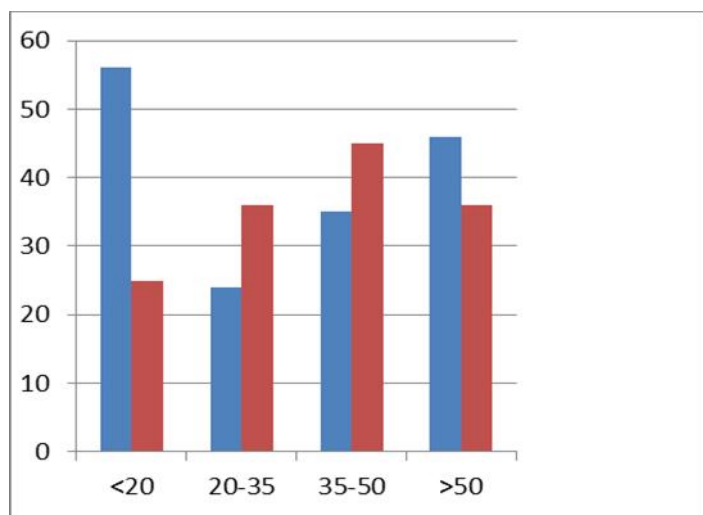
The data were subjected to descriptive examining using Microsoft Excel. Use of various classes of medicines as well as individual medicines was analyzed and presented as a percentage.

**3. RESULTS AND DISCUSSIONS**

The total no. of prescriptions investigated was 252 .The numbers of drugs per prescription varied from one to more than four Among the 252 prescriptions evaluated, 142 (56.38%) were male patients and 110(43.61%) female patients. Most of the cases were in age group 35-50 years of age (44.04%), followed by >50 years of age (22.23%). (Table 1)

**Table 1: Demographic characteristics of the patients**

Age(yrs)	%according to age	Male	Female
<20	15.5	22	17
20-35	18.23	25	20
35-50	44.04	63	49
>50	22.23	32	24

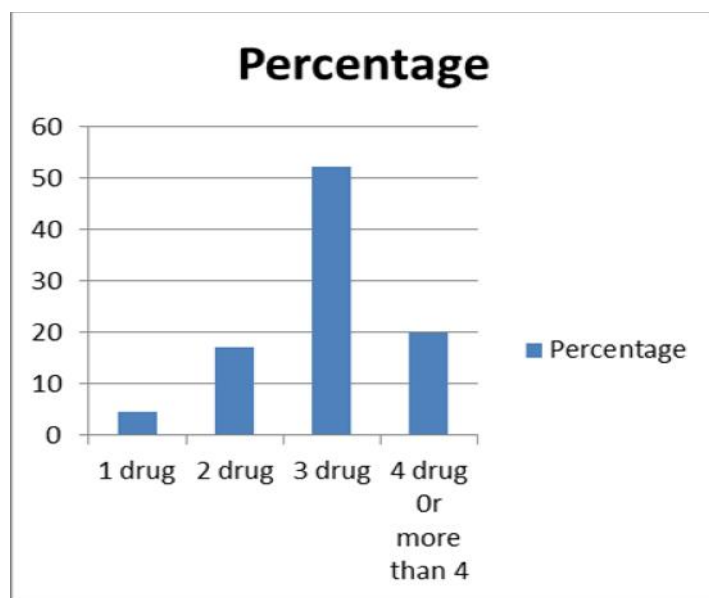


**Graph 1: Demographic characteristics of the patients**

3 medications were most usually prescribed in 52.15% sufferers, followed by 4 drugs in 19.78% sufferers.

**Table 2: Number of Drugs Prescribed per Prescription**

Number of drugs	Percentage
1 drug	68.32
2 drug	25.6
3 drug	6.08
4 drug Or more than 4	9.52



**Graph 2: Number of Drugs Prescribed per Prescription**

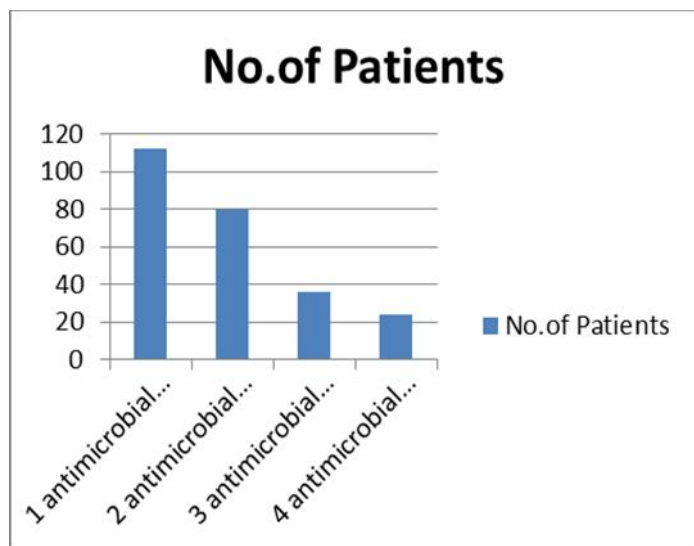
Diagnosis was mentioned in only 64.53% of prescriptions. We observed that percentage of antimicrobials among the total drugs was 30.25%, analgesic/antipyretic/anti-inflammatory were 33.75%, acid lowering drugs were 17.34%. (Figure 1)

Among the 252 prescriptions 187(30.25%) were antimicrobials. one antimicrobial was prescribed in 68.32% patients, two antimicrobial in 25.6% as shown in table 3. Amoxicillin was the most usually prescribed AMA (50.66%) followed by cotrimoxazole (26.05%), cephalexin (8.50%) and ciprofloxacin (5.8%) with their ATC codes as in Table 4. After assessing of prescription data it was observed that 79.18% antimicrobials were prescribed by

generic name 0 5 10 15 20 25 30 35 40 Percentage Admane PD et al Research Article IJPR Volume 5 Issue 2 (2015) 33 while 20.82% antimicrobials were brand name. Amongst antimicrobials 29.18% were fixed drug combinations, out of which 0.75% were not from rational drug combination given by WHO. All the cases were treated symptomatically by the clinical judgment.

**Table 3: Number of antimicrobials Prescribed per Patient**

Antimicrobials prescription	No.of Patients	%
1 antimicrobial drug	112	68.32
2 antimicrobial drugs	80	25.6
3 antimicrobial drugs	36	6.08
4 antimicrobial drugs	24	9.52

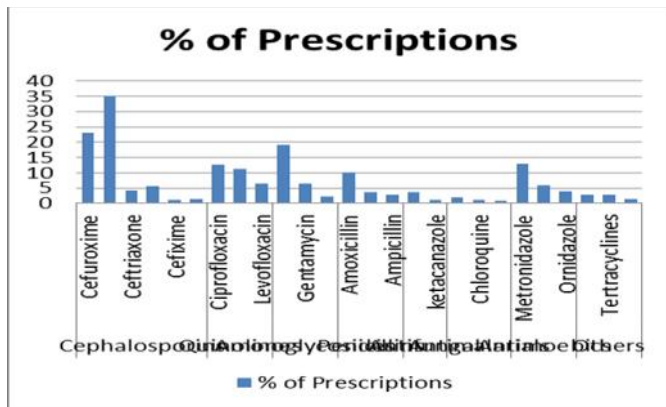


**Graph 3: Number of antimicrobials prescribed per patient**

**Table 4: percentage of most commonly prescribed antimicrobial with ATC classification**

Drug class	Drug	% of Prescriptions
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Cephalosporins	Cefuroxime	23.12
	Cefotaxime	35.13
	Ceftriaxone	4.21
	Cefoperazone	5.50
	Cefixime	1.20
	Cefepime	1.36
Quinolones	Ciprofloxacin	12.53
	Ofloxacin	11.25
	Levofloxacin	6.32
Aminoglycosides	Amikacin	19.2
	Gentamycin	6.35
	Streptomycin	2.13
Penicillins	Amoxicillin	10.2
	Penicillin-V	3.52
	Ampicillin	2.89
Antifungal	Fluconazole	3.54
	ketacanazole	1.02
Antimalarials	Artesunate	1.89
	Chloroquine	1.20
	Primaquine	0.78
Antimoebics	Metronidazole	12.8
	Tinidazole	5.98
	Ornidazole	3.98
Others	Macrolides	2.78
	Tetracyclines	2.78
	Vancomycin	1.28



**Graph 4: percentage of most commonly prescribed antimicrobial with ATC classification**

**Table 5: Frequency of systemic infection in different months**

System involved	Highest frequency	Lowest frequency
GIT	FEB(70%)	FEB(15%)
Cvs	MARCH(85%)	MARCH(10%)
CNS	APRIL(50%)	APRIL(5%)(10%)
RS	MAY(70%)	MAY(10%)
OTHERS	JUNE(60%)	JUNE(10%)

It was noticed that 1, 2, 3 & 4 or >4 Antimicrobials were prescribed to 44.44%, 31.74%, 14.28% & 9.52% respectively (Table-1). In all the Antimicrobials Cephalosporins was observed to be prescribed to the large number (71.42%) of sufferers, followed by Quinolone (39.68%), Antifungal (8%), Penicillin's (19.04%), Antiamoebic (24%), Aminoglycoside (28.57%), Antimalarial (4.5%) & others were 8% (Fig-1). In all the cephalosporin's use of cefuroxime was biggest (33.33%), followed by Cefixime, cefotaxime (25.39%), ceftriaxone (6.32%), Cefoperazone, Cefepime each were 1.58%. In all the fluoroquinolones it was noticed that Ciprofloxacin was mostly promoted (14.28%), followed Ofloxacin (12.69%), Norfloxacin (4.79%) Levofloxacin (7.9%), .Amikacin in the Aminoglycosides was the most chosen medicaion (20.62%) followed by Gentamicin (4.75%), streptomycin (3.75%). In all Penicillins, Amoxicillin was used to the extent of 11.1%, followed by Benzyl Penicillin 4.75% and

Ampicillin 3.17%. In all the oral antifungal medications Fluconazole was noticed to be the most favoured to the extent of 4 % followed by Itraconazole 2.7% and Ketoconazole 1.3% .Artesunate was prescribed to 2 %. Chloroquine 1.7 % & Primaquine 0.8% as antimalarials. Among Antiamoebic drugs Metronidazole was used to the extent of 13.6%, followed by Tinidazole 6.4% & Ornidazole 4 %. Macrolides, Tetracyclines, Vancomycin were used in 3.1%, 3.1% & 1.5% respectively (Table-2). Sufferers admitted due to CVS disorders were noticed to be high among all the disorders (85%) in the month of May & lowest in the month of January (10%). Infections of the nervous system caused to the extent of 15 % in the February & 5 % in the July. Other infection were found 60% in August and the lowest occurrence was in March (10%) (Table- 3). In young male sufferers Aminoglycisides & Antimalarials were found to be highest & lowest prescribed medications respectively whereas Cephalosporins & Quinolone were highly favored for younger as well as older female sufferers .Younger age male sufferers were mostly admitted for the CVS & endocrine disorders. However in younger & adult female patients were commonly associated with CVS & GI disorders. (Fig 2 & 3)

The clinical setting in the medical ward warrants the use of drugs from various drug classes. Rational prescription of medications is essential for better sufferer 0 10 20 30 40 50 60 70 80 percentage. The first step in any intervention to improve medicine use to evaluate the extent of existing problem in prescribing. The objective of our trail was to assess the drug use patterns among sufferers admitted to the IPD of a tertiary care hospital. The demographic outcomes of sufferers admitted to the IPD over a period of 12 months revealed a male preponderance with a average age of around 50 yrs, similar to a trail carried out in Nepal in 2005.10 In contrast, Smythe et al (1993) showed an equal no.of male and female sufferers admitted to the hospital with a average age of 65 years.11 Previous Indian trails also documented male predominance which propose that more males are admitted in an Indian setting for infections.12 The probable reasons for this finding could be the male to female ratio is higher in the state of Telangana and overall in the India. In the Indian scenario it is noticed that female peoples are reluctant to use health care facilities even if they are critically ill and especially from lower socioeconomic strata. A wide spectrum of clinical diagnoses was noticed involving sepsis, renal failure, acute RDS, multi organ dysfunction, head injury, CVS related diseases and diabetes difficulties. Debilitating condition of the sufferers due to underlying disorders,

invasive diagnostic and therapeutic procedures and prolonged use of life support equipment predisposes these sufferers to infections. It was noticed that most of the antimicrobial medications were prescribed by brand name (60%) which requires revision of current prescribing practice. Extensive polypharmacy (> 90 %) that is more than five medicines were prescribed in all the sufferers. Polypharmacy is defined as alternate use of five or more medications and it could enhance medicine interactions and drug associated problems. It is difficult to manage sufferers in the IPD with multiple co morbidities with less no. of medicines as they needed medications for their specific conditions as well as for prophylaxis, but it is also essential to keep a balance between the no. of medicines and efficient pharmacotherapy. High antimicrobial prescribing frequency was noticed in our trail inconsistent with earlier studies from Nepal [14] which documented 30%. More than one antimicrobial product was prescribed among (69%) of the prescriptions. This could be expected since Diabetes, multi organ dysfunction, IHD, RTT was prevalent among the sufferers of the present trail necessitating therapeutic as well as preventive use of antimicrobials. Antimicrobial protocol and regulations; formulary based antimicrobial restrictions can be used to improve rational usage of antimicrobials. A multidisciplinary approach can be acquired in the ICU and IPD set up involving ICU specialist; infectious disorders control specialist, pharmacists and microbiologists can work together for more rational antimicrobial pharmacotherapy.

Antimicrobial opposition is one of the important global preventable problems. The causes of antimicrobial opposition are unnecessary utilization, inappropriate doses, inadequate duration of treatment and irrational fixed dose medications combinations. Hence this trail was undertaken to improve the standard of medicine and to promote the prescription of medications. Average no. of medicines per person is a major index of prescription audit. Mean no. of medicine per prescription should be kept as low as possible. Higher figures (polypharmacy) always lead to elevated risk of drug interaction, AEs, development of bacterial resistance, elevated hospital cost. In our trail most of prescriptions contained three medicines and antimicrobial single drug treatment was the main stay. fluoroquinolones (6.97%) sulphonamides (26.05%) and lactam antibiotics (61.54%) were the preferred medications. Lactam antibiotics were usually prescribed medicines corresponding with the previous trails. [9,10] This might be due to their round the yr availability. As ours

is a government institution, cheaper efficacious medications are preferred considering the budget. Among the antimicrobials amoxicillin (50.66%), cotrimoxazole (26.05%), cephalexin (8.50%) were usually prescribed medicines. Their ATC codes are J01CA, J01EE, J01DA respectively. ATC classification can be helpful in ADR monitoring which is the need of the hour. Also, it has a role in drug use studies. We found that 70.18 % medications were prescribed by generic name. In our trail prescription of generic medicines were more usual than brand name medications which is same with previous trails. [11,12] Generic medications are cheaper than brand name medications. Moreover, ours is a tertiary care hospital where prescription of generic medications is always emphasized. But this is in contradiction to some previous studies where brand name medications were usually prescribed. [13,14] In our trail FDC were 29.18% as in other trail. [15] 0.75% FDC are not from rational medications list given by WHO. Irrational FDC must have been prescribed depending on the sufferer's need otherwise only rational FDC are preferred. Health care professionals must have a clear understanding of rational therapeutic utilization of antibiotics. They must be aware of the prevalence of various pathogens and opposition patterns in their hospital and exercise good judgment in selection of the antibiotic regimens. [16] Irrationality can be addressed by use of regulations, educational activities and surveillance at all level of health care. So, calculation should be taken to eradicate the inappropriate utilization of antibiotics. Drug use review programme must be carried out to examine the rational utilization of antimicrobials.

#### 4. CONCLUSION

We can conclude from the present trail that health care provider preferred to prescribe 2 or more than 2 antimicrobial medications in a prescription. To manage various infections quinolones and Cephalosporins were observed to be most prescribed antibacterial. Fluconazole, Artesunate & Metronidazole were found to be commonly prescribed antifungal, antimalarial and ant amoebic agents. Use of Macrolides, Tetracyclines & Vancomycin was very low. However, aminoglycosides were usually prescribed to young males and Cephalosporin's to young female sufferers. A wide spectrum of clinical diagnosis and different kinds of drugs were used for different drug classes. Overall, the scope for improving rational use of antimicrobial agents exists. Antibiotic defiance as elevated at an alarming rate leading to elevated morbidity, mortality and therapy cost. A key character in the improvement of an antibiotic defiance is inappropriate utilization of antibiotics. The medical fraternity requires to understand

that antibiotics are valuable and finite resources, and unless aware of efforts are made to contain the problem of drug defiance, multidrug defiance organism untreatable by ever known antibiotic may emerge reversing the medical progress by ranking and returning as back to pre-antibiotic. Pharmacoeconomic trails in the hospital can encourage cost efficiency antimicrobial drug treatment. This will help in rationalizing prescribing practices depending on the feedback from these trails and practices between institutions, regions and countries can be equated. The rational use of antimicrobial products is one of the main contributors to control worldwide emergence of antibacterial defiance, SEs and decreased cost of the therapy. Antibiotic defiance is an emerging problem worldwide which can be controlled by rational prescription, Restricting the no.of antimicrobial prescription and appropriate selection of the drug.

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