



**ORIGINAL RESEARCH PAPER**

**Pharmacology**

**PRESCRIBING TREND OF COMMONLY USED ANTIMICROBIALS WITH COMMENTS ON RATIO OF PRESCRIBED DAILY DOSE AND DEFINED DAILY DOSE IN ADULT INDOOR PATIENTS IN TERTIARY CARE TEACHING HOSPITAL.**

**KEY WORDS:** Antimicrobials, PDD, ATC, DDD.

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**ABSTRACT**

**Objective:** To study prescribing trend of commonly used antimicrobials with emphasis on ratio of PDD & WHO DDD at GMCH Akola.  
**Materials and Methods:** A retrospective observational study was conducted during 1 year period at GMCH Akola. The case papers of patients who satisfied eligibility criteria were included in the study (n=300). Relevant data were collected & ratio of PDD and DDD calculated to comment on adequacy of dosing of commonly used antimicrobials.  
**Result:** Mean age of the patients in study was 34.42±11.54 (Mean±SD). Ratio of PDD and DDD was determined. Ceftriaxone, Metronidazole & Norfloxacin were prescribed in adequate dose, while Amoxicillin-clavulanic acid, Artesunate, Cefoperazone-sulbactam & Cefotaxime were prescribed in under dose whereas ciprofloxacin was prescribed in overdose.  
**Conclusion:** Education and training of prescriber with formulation an antibiotic policy and its implementation for hospitals will be helpful in rationalizing the prescription of antimicrobials.

**INTRODUCTION:**

Infectious diseases are a important cause of mortality in the developing countries.[1] Various studies indicate that out of total drugs prescribed, 28 to 42% of the drugs are antimicrobial agents.[2] Inappropriate antibiotic prescribing and the increasing levels of resistance are now global problem.[3] The Anatomical, Therapeutic, Chemical (ATC) classification system provides global standard for classifying drugs. The ATC and defined daily dose (DDD) classification system serves as tool for drug utilization research and allows comparison of drug consumption statistics at international and other levels of healthcare system.[4] Differences between Prescribed Daily Dose (PDD) and Defined daily dose (DDD) have been reported in several studies focusing on, for example, antiepileptic, antibacterial, statins or oral hypoglycaemic agents.[5]

The antibiotic policy is available at central and state govt level but not implemented effectively at local level. This study was conducted to determine the ratio of Prescribed Daily Dose and World Health Organization (WHO) Defined daily dose (DDD) to comment on adequacy of dosing of antimicrobial agents (AMA) used in tertiary care teaching hospital.

**AIMS AND OBJECTIVES:**

1. To determine the prescription pattern of commonly used antimicrobials in indoor patients at Government Medical College, Akola.
2. To determine ratio of Prescribed daily dose (PDD) and WHO Defined daily dose (DDD) to comment on adequacy of dosing of some commonly used antimicrobial agents.

**MATERIALS AND METHODS:**

This study was a non-interventional, retrospective, observational study, conducted in department of Pharmacology at tertiary care teaching hospital. The data was collected from Medical Record section of Govt. Medical College Akola, Maharashtra and study was carried out from August 2013 to July 2014. Total 300 case papers were assessed and enrolled during one year of study. To evaluate the drug prescribing pattern a specially designed proforma containing relevant details such as age, sex, clinical diagnosis, associated co-morbid conditions, length of stay,

antimicrobials prescribed, route of administration, frequency, dosing schedule were assessed daily and recorded in proforma. Antimicrobial agents were classified using the Anatomical therapeutic chemical classification (ATC) system; and ratio of prescribed daily dose (PDD) and WHO defined daily dose (DDD) was calculated to comment on adequacy of dosing of antimicrobial agents (AMA).[5],[6]

**Inclusion criteria:** Case papers of adult indoor patients from record section in age group of 18-65 years of age, including both sexes, with antimicrobials agent in prescription were analyzed and included in the study.

**Exclusion criteria:** Patients discharged against medical advice and absconded from hospital, patients on anti-tubercular treatment, pregnant women, paediatric age, case papers with insufficient information on dose schedule, duration of treatment, prescriptions with no antimicrobials given were excluded from the study. **Statistical analysis** was done using Microsoft Excel and IBM SPSS Statistics 20. Wherever necessary, the results were depicted in the form of percentages with tables, graphs and figures. Microsoft Word, Microsoft Excel and IBM SPSS Statistics 20 were used to generate graphs and tables.

**RESULTS:**

Out of 300 patients 165 (55%) were male and 135 (45%) were females. 110 (37%) patients belong to age group of 21-30 years, while 90 (30%) patients were in age group of 31-40 years. The mean age of all the patients was 34.42 ± 11.54 as mentioned in **table 1**.

**Table 1. Demographic pattern of commonly used antimicrobial agents.**

Variables	Values (%)	
Total number of prescription ( n=300)		
<b>Sex</b>	<b>No. of patients</b>	<b>Mean±SD</b>
<b>Male</b>	165 (55%)	33±17.95
<b>Female</b>	135 (45%)	27±20.54

Age range (18-65 years)

No. of patients in 18-20 years of age group	23 (7.67%)
No. of patients in 21-30 years of age group	110 (36.67%)
No. of patients in 31-40 years of age group	90 (30.00%)
No. of patients in 41-50 years of age group	41 (13.67%)
No. of patients in 51-65 years of age group	36 (12.00%)
(Mean±SD * )	34.42±11.54

**\*SD- Standard deviation**

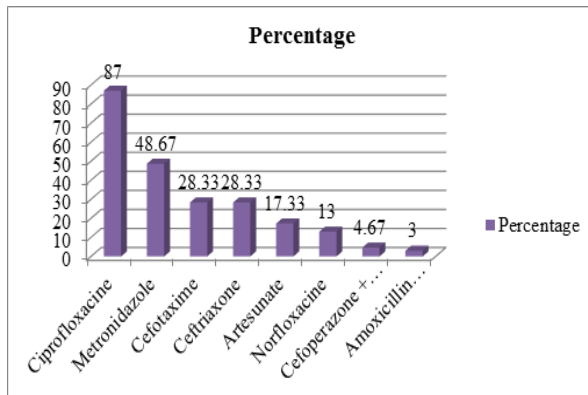
The clinical conditions for which antibiotics were prescribed were acute gastroenteritis (18.33%), malaria (17.33%), pyrexia of unknown origin (PUO) (15%), typhoid fever (15%) and urinary tract infection (14.33%), which is shown in **table.2**.

**Table 2: Distribution of cases according to illness.**

Illness	No. of cases (%)
AGE	55 (18.33%)
COPD	18 (06%)
Hepatitis	29 (9.67%)
Malaria	52 (17.33%)
Pneumonia	13 (4.33%)
PUO	45 (15%)
Typhoid fever	45 (15%)
UTI	43 (14.33%)
TOTAL	300 (100%)

**AGE-** Acute gastroenteritis, **COPD** - Chronic obstructive pulmonary disease, **PUO-** Pyrexia of unknown origin, **UTI-** Urinary tract infection

The average **number of antibiotics** per prescription was 3.5, 195(65%) patients were prescribed two antibiotics, 96(32%) were prescribed three antibiotics, and only 9(3%) were prescribed four antibiotics respectively. In the present study, majority of patients i.e. 261(87%) were prescribed with Ciprofloxacin, 146(48.67%) patients were prescribed Metronidazole, 85(28.33%) patients were prescribed Cefotaxime, and 85(28.33%) patients were prescribed Ceftriaxone respectively as mentioned in **Fig 1**.



**Fig 1. Distribution of antimicrobial agents in percentage.**

Studies based on ATC/DDD are superior for comparing the use of drugs between global or on regional levels. We determined the prescribed daily dose (PDD) as the dispensed daily dose and compared it with WHO Defined daily dose (DDD). We also determined the ratio of prescribed daily dose (PDD) to WHO Defined daily dose (DDD) and commented on adequacy of dosing of antimicrobials as shown in **table 3**. In case of antimicrobials like Ceftriaxone, Metronidazole, Norfloxacin adequate dose was prescribed as PDD was equal to WHO DDD and ratio of PDD to WHO DDD was equal to 1. In case of Ciprofloxacin overdose was given as PDD is more than WHO DDD and their ratio is more than 1. While in case of AMA like Amoxicillin-clavulanic acid, Artesunate, Cefoperazone-sulbactam, and Cefotaxime under-dose was prescribed as PDD is less than WHO DDD and their ratio is less than 1 as mentioned in **table 3**.

**Table 3: ATC Code, PDD and WHO DDD of commonly used antimicrobial agents.**

Antimicrobial agent	ATC Code	PDD (gm)	WHO DDD (gm)	Ratio of PDD/WHO DDD	Adequacy/Inadequacy of dose.
Amoxicillin + clavulanic acid	J01CR02	2.4	3	0.8	Underdose
Artesunate	P01BE03	0.12	0.28	0.42	Underdose
Cefoperazone + sulbactam	J01DD62	3	4	0.75	Underdose
Cefotaxime	J01DD01	2	4	0.5	Underdose
Ceftriaxone	J01DD04	2	2	1	Adequate
Ciprofloxacin	J01MA02	1	0.5	2	Overdose
Metronidazole	J01XD01	1.5	1.5	1	Adequate
Norfloxacin	J01MA06	0.8	0.8	1	Adequate

**ATC:** Anatomical therapeutic chemical classification, **WHO:** World Health Organization **DDD:** Defined daily dose, **PDD:** Prescribed daily dose.

**DISCUSSION:** The mean age of all patients in present study was 34.42±11.54 years (Male age 33±17.95 and Female age 27±20.54). Age group of 21-30 years has maximum number of cases (110) contributing 36.67% of total patients followed by age group of 31-40 years (90) which contributes 30% of total patients in the study. Hedamba et al (2016) [7] found that 37.64% of patients were in age group 18-37, 35.12% patients were in age group of 38-57 these result are consistent with our study. Out of 300 cases studied, number of cases having Male patients were 165 (55%) and Females cases were 135 (45%). This results corresponds to results obtained in Meher et al. (2014) [8] which shows 58% were male and 42% were female. In present study most common illness found was Acute gastroenteritis in 55 (18.33%) number of cases followed by Malaria in 52(17.33%) patients followed by typhoid fever in 45 (15%) and pyrexia of unknown origin in 45 (15%) patients .

It was found that most commonly prescribed antimicrobial agents (AMA) were Ciprofloxacin in 261 (87%) cases, Metronidazole 146 (48.67%), Cefotaxime 85 (28.33%), Ceftriaxone in 85 (28.33%), Artesunate in 52 (17.33%), Norfloxacin in 39 (13%) and Cefoperazone +sulbactam in 14 (4.67%) prescriptions respectively. Average number of antimicrobial agents (AMA) per prescription was found 3.5 in our study. In Meher et al study (2014) [8] found that commonly given antibiotics were Ceftriaxone (30%), amoxicillin-clavulanic acid in (22.6%), amikacin in (16.63%), ciprofloxacin in (13.41%), Metronidazole in (12.34%), and levofloxacin in (5.09%) prescriptions. In Meher et al study (2014) [8] average no. of antibiotics per prescription was found 1.83. In present study we also found that number of prescription having 2 AMA, 3 AMA, and 4 AMA were 195(65%), 96(32%), and 9(03%) respectively. Anand et al (2016) [9] found that 27.1%, 11.9%, 2.5% prescriptions were having 2 AMA, 3AMA, and 4 AMA respectively. Venkateswarlu et al [10] found that 25 (12.5%) prescriptions had 1 AMA, 95 (47.5%) had 2 AMA, 60 (30 %) had 3 AMA, 20 (10%) prescriptions had more than 3 AMA. Prescription of antibiotics varies according to the disease condition, its severity and other co morbid conditions.

It is evident from this study that Amoxicillin-clavulanic acid, Artesunate, Cefoperazone-sulbactam, Cefotaxime AMA were prescribe below adequate dose (Undersdose), while Ceftriaxone, Metronidazole, Norfloxacin were prescribed in adequate dose and only ciprofloxacin was prescribed in overdose. Naik et al (2016) [11] found that Cefotaxime, Cephalixin, Ofloxacin, Nitrofurantoin, Amikacin were prescribed below adequate dose (Under dose), while Ceftriaxone, Ciprofloxacin, Norfloxacin, Levofloxacin, Azithromycine were prescribed in overdose, and Cefixime, Ofloxacin prescribed in adequate dose in patients of urinary tract infections.

**CONCLUSION:** Since ciprofloxacin was prescribed in overdose & some antimicrobial agents were given in under dose; formulation

of antimicrobial policy along with its proper implementation is need of hour in developing countries. Education and training of prescriber will be helpful in rational prescription of antimicrobial agents. Further studies with increased in study duration and more sample size are needed to determine adequacy and inadequacy of dosing of commonly used antimicrobial agents in tertiary care hospitals.

**DECLARATIONS:**

**Funding:** None

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee.

**ABBREVIATIONS USED:** **AGE:** Acute gastroenteritis, **AMA:** Antimicrobial agents, **ATC:** Anatomical therapeutic chemical classification, **DDD:** Defined daily dose, **PDD:** Prescribed daily dose, **WHO:** World Health Organization

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