Research Article

Drug Use Evaluation of Antimicrobials in Healthcare Resource Limited Settings of India

Mohanraj Rathinavelu*[1], Suvarchala Satyagama[1], Ramkesava Reddy[2], Yiragamreddy Padmanabha Reddy[1]

[1]Department of Pharmacy Practice, Raghavendra Institute of Pharmaceutical Education and Research–RIPER, Anantapuramu, Andhra Pradesh, INDIA.
[2]Department of General Medicine, Rural Development Trust Hospitals, Bathalapalli, Anantapuramu, Andhra Pradesh, INDIA.

ABSTRACT

Background: Antimicrobial medications are considered as the greatest discovery of the twentieth century. The emergence of antibiotic resistant bacteria is a major problem throughout the world and a rational use of antibiotics is therefore very important. Drug utilization research facilitates the rational use of drugs and suggests a way to improve prescribing habits. **Aim:** The study was designed to evaluate the pattern of drug utilization in inpatients of general medicine department of a secondary care referral hospital of India. **Methods:** The data was obtained prospectively from 80 inpatients prescriptions, the DDD/100 bed days was calculated were multiple antimicrobial drug use is very common. **Results:** The study showed inappropriate drug use in case of dengue fever with ceftriaxone and ciprofloxacin, upon observations drugs like ceftriaxone, augmentin and primaquine were found to be used in a higher proportions. On calculation of DDD the drug nitrofurantoin use was high when compared to WHO DDD. Also, anti-malarial drug primaquine use was higher. **Conclusion:** In conclusion, the study indicate that there is a substantial scope for improvement in prescribing pattern by adhering to standard guidelines of treatment and restriction policies to promote rationality drug use.

Key words: Anatomical and therapeutic classification system, Antibiotic restriction policies, Defined daily dose, Drug utilization research, Pharmaceutical care, Rational use.

INTRODUCTION

Health is the extent to which an individual or group is able, on the hand, to realize aspirations and satisfy needs; and, on the other hand, to change or cope with the environment. Health as a result, seen as a resource in support of everyday life, not an entity of living; it is a constructive concept emphasizing social and individual resources, as well as substantial capacities.[1] The conventional role in preparing and providing medicines and informing patients concerning their use, pharmacists are well placed to assume responsibility for the supervision of drug therapy.

Pharmacists put forward specialized services in a multiplicity of settings in response to local, national and international requirements, through a hub on population or patients. Pharmaceutical public health includes services to populations, such as local guidelines and treatment protocols, medicine use review and evaluation and essential medicines list. Hence, pharmaceutical public health has been defined as the application of pharmaceutical knowledge, skill and resources to the science and art of preventing disease, prolonging life, promoting, promoting and improving health for all through the organized effort of society.[2]

There have been many changes to this definition, Hepler and strand gave a new definition as Pharmaceutical care is a responsible provision of drug therapy for the principle of achieving distinct outcomes that recovers the patient quality of life.[3]

The three most common situations for antibiotic abuse: It has been practical that the three commonest reasons for prescribing antibacterial are fever, sore throat and

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Address for correspondence:
Dr. Mohanraj Rathinavelu. Pharm. D,
Assistant Professor and Academic In-charge
Department of Pharmacy Practice, Centre for Pharmaceutical Research, Raghavendra Institute of Pharmaceutical Education and Research-RIPER, Anantapuramu, Andhra Pradesh, INDIA.
Phone no: +91 8121934940
E-mail: moley4u@rediffmail.com

www.ijopp.org

diarrhea. In all these three situations, antibacterial are most often prescribed unreasonably. Use of antibacterial in non-bacterial infections, result in the devastation of susceptible bacteria and careful production of resistant strain bacteria, accordingly aiding the broadcasting of bacterial drug resistance.

Antibacterial combinations can be useful in sharpening the effect of drug, prevention of resistance, and overcoming resistance.[4] According to WHO, rational drug use is defined as "patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community."
In the present era, irrational use of drugs is well thought-out as a global problem. There are many factors that manipulate prescribing pattern which include deficient in training and education, heavy patient load and demands to prescribe. Antibacterials are the most imperative weapons in our hands. Hence, evaluation can be done by making audit of prescribing and dispensing indicators. Manifestations of irrational prescription include use of drugs when no drug therapy is indicated, breakdown in on condition that provide safe and effective drugs, pointless use of expensive drugs. Hence, by observing all the above factors national drug policy should be alarmed not merely with the contribution of safe and appropriate use of drugs but assessing the problem of irrational use and to tackle irrational use of medicines, prescribing, dispensing and patient use should be frequently monitored in terms of the types of irrational use, so that strategies can be beleaguered in the direction of changing specific problems and the extent of irrational use, so that amount of the problem is known, which can be monitor further.

There are numerous well-distinguished methods to determine the degree of irrational use, comprehensive medicine (drug) consumption data can be used to spot out expensive medicines of lower efficacy, Anatomical Therapeutic Classification system (ATC)/Defined Daily Dose (DDD) to measure up the drug consumption among institutions or regions and lastly WHO drug use indicators such as prescribing indicators, patient care indicators, facility indicators, complementary drug use indicators. Hence, our study was designed to analyze the prescribing pattern and appropriateness use of antibiotics in a secondary care referral hospital of India.

MATERIALS AND METHODS

The current prospective cohort study of six months duration (January to June 2015) was designed to evaluate the prescribing pattern and appropriateness of antibiotic use in 80 inpatients of General medicine department of a secondary care referral hospital in India by obtaining proper approval from hospital authority. Patients who met the study protocol were included and the required data were collected from in-patient medical records and the obtained data were evaluated in relation to the drug use and ATC/DDD method was used to measure the outcome. Patients admitted in medical wards diagnosed with acute infections for which antibiotics are prescribed were included in the study. Patients in the emergency and out-patient department, pediatric and geriatric patients, HIV/Immune compromised patients and terminally ill patients were excluded. Initially on ward round participation demographic details, past medical and medication history, reports of laboratory investigations were collected with proper patient information consent and documented in a data entry form. From which outcome measurement was evaluated for the drug consumption (DDD).

Outcome measurement: Data of the six months study was evaluated for the amount of drug consumption. Following are the formulas which were used to measure the outcomes.

$$DDD = \frac{\text{No. of items issued} \times \text{Amount of the drug per item}}{\text{WHO recommended DDD of Drug}}$$

$$DDD/100 \text{ bed days} = \frac{\text{Drug consumption (mg)} \times 100}{\text{DDD (mg)} \times \text{No. of days in study period} \times \text{Total no. of beds} \times \text{Occupancy index}}$$

Total number of beds used is 30. The occupancy index was calculated by dividing the number of beds occupied by the total number of beds.

RESULTS

A total of 80 infectious diseases were assessed for drug utilization of antibiotics for the 6 months study period. The drug usage was calculated from the collected data and compared. The demographic details of study participants are represented in Table 1 (Age group of patients who were more prone to infectious diseases).

The prevalence of diseases based on gender distribution is represented in Table 2 (Prevalence of the disease on gender basis).

Table 1: Age group of patients who were more prone to infectious diseases

Age (in years)	Number of patients
18–30	23
31-45	28
46-60	25
61–75	4

Table 2: Prevalence of the disease on gender basis

Disease	Male	Female	Number of patients
Urinary tract infections	9	13	22
Malaria	10	11	21
Dengue	11	5	16
Lower respiratory tract infections	6	4	10
Enteric fever	4	7	11

Table 3: Classification of antibiotics utilization in their respective diseases and also their values of WHO DDDs and ATC codes

UTI	Dose (in gm)	DDD (in gm)	ATC codes	ROA
Ceftriaxone	1	2	J01DD04	IV
Chloramphenicol	0.5	3	J01BA01	Per oral
Nitrofurantoin	0.5	0.2	J01XE01	Per oral
Cefixime	0.2	0.4	J01DD08	Per oral
Dengue	Dose (in gm)	DDD (in gm)	ATC codes	ROA
Ceftriaxone	1	2	J01DD04	IV
Ciprofloxacin	0.2	0.5	J01MA02	Per oral
LRTI	Dose (in gm)	DDD (in gm)	ATC codes	ROA
Augmentin	0.625	3	J01CR02	Per oral
Doxycycline	0.1	0.1	J01AA02	Per oral
Enteric fever	Dose (in gm)	DDD (in gm)	ATC codes	ROA
Ceftriaxone	1	2	J01DD04	IV

The antibiotics used for the disease treatment was classified based on its utilization and their values of WHO DDD and ATC codes is tabulated in Table 3 (Classification of antibiotics utilization in their respective diseases and also their values of WHO DDDs and ATC codes).

The total number of items issued for each particular drug is calculated was the sum of each particular drug is calculated in their respective disease. The sum represents the number of units administered from the day of admission to the discharge, which is calculated for every single patient is reported in Table 4 (Antibiotics drug utilization).

The drug consumption in DDD/100 bed days was calculated, initially DDD for each drug have been calculated for the estimation of average maintenance dose using the formula given by WHO and represented in Table 5 (Drug consumption in DDD/100 bed days using DDD value).

Here, the drug Nitrofurantoin use was high as the dose of this drug used in our site was high when compared to WHO recommended DDD. The utilization of primaquine was also found to be higher in the malarial disease. As there are several methods for utilizing DDD to describe drug expenditure, DDD per 100 bed days is the one which may be applied when the drug use by inpatients is considered. Here the occupancy index has been calculated using the ratio of number of beds occupied to the total number of beds. In our study the occupancy index was found to be 0.93.The bed count was 30 and the number of days was 180.

Table 4: Antibiotics drug utilization

Drugs	Total number of units administered
Ceftriaxone	41
Nitrofurantoin	21
Chloramphenicol	10
Cefixime	10
Ciprofloxacin	10
Amoxicillin +Clavulanic acid	41
Doxycycline	16
Chloroquine	10
Primaquine	39

Table 5: Drug consumption in DDD/100 bed days using DDD value

Drug	DDD (drug usage)	DDD/100 bed days
Ceftriaxone	20.5	0.00020
Nitrofurantoin	52.5	0.00052
Chloramphenicol	1.6	0.00001062
Cefixime	5	0.0002489
Ciprofloxacin	4	0.000159
Amoxicillin +Clavulanic acid	8.54	0.00005668
Doxycycline	16	0.00318598
Chloroquine	5	0.00019912
Primaquine	39	0.0517722

DISCUSSION

A total of 80 cases of prescriptions were been analyzed for demographic variables; indications; duration; proportion of drugs used to assess the prescribing pattern of antibiotics in the in-patient hospital settings. DDD/100 bed days were calculated. Ceftriaxone of third generation cephalosporins, ciprofloxacin of quinolone antibiotics, Amoxicillin+clavulanic acid, primaquine, doxycycline are the most commonly used antibiotics as an empirical regimen. As per our study results, augment in a combination of Amoxicillin+clavulanic acid was the most frequently used anti-microbial agent. These results were in accordance with a study by Mahendra k patel *et al*. 2014[5] which reported that upon the utilization of various types of, antibiotics a combination of cefotaxime and metronidazole was found to be used in higher proportion. Praveen K G *et al*. 2013[6] performed a prospective study on drug utilization and evaluation of HMG-Co-A reductase inhibitors. The study used the methodology of DDD/12 bed days, which shown that statins are more prescribed for various indications. The authors from the study concluded that dosage units for Atorvastatin were nearer to WHO DDD where as variation is observed in case of simvastatin and Rosuvastatin. As per our study findings, the drug Nitrofurantoin dosage units were found to be high when compared with WHO recommended maintenance dose. Khavane K *et al*. 2010[7] performed a study on prescribing pattern of antibiotics and sensitivity patterns of micro-organisms towards different antibiotics reveals that information about antibiotic use and resistance patterns of common microorganisms are lacking in hospitals in India. Excessive and inappropriate use of an antibiotic contributes to the development of bacterial resistance. LRTI and UTI are the most frequent clinical conditions for which an antibiotic was prescribed. This study was carried out to collect relevant demographic information, antibiotic prescribing patterns to supervise, assess and put forward modification in practitioners prescribing habits so as to create medical care rational. In this study the number of samples which were sent for culture and sensitivity testing were little. Two or more antibiotics were prescribed to patients in whom the antibiotics were distorted either after reviewing the culture and sensitivity results. As per our study findings, many of the antibiotics are prescribed previous to the availability of culture sensitivity reports. So, a prerequisite of microbiological investigation before treatment of infections is essential.

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CONFLICT OF INTEREST

The author declare no conflict of interest.

ABBREVIATION USED

ATC:	Anatomical Taxonomical Chemical Classification
DDD:	Defined Daily Dose
WHO:	World Health Organization
ROA:	Route of Administration
IV:	Intravenous
UTI:	Urinary Tract Infection
LRTI:	Lower Respiratory Tract Infection

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