

PRESCRIBING PATTERN OF ANTI-MICROBIALS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective

The main objective is to study the prescribing practice of antibiotic in a tertiary care hospital.

Methods

A retrospective follow up study of six months duration was undertaken during June-November of 2010. A total number of 16,121 patients were taken for the study. The analysis was done for the number of antimicrobials in each prescription, prescribing frequency of individual drug, number and dosage unit prescribed (DDD), age and sex frequency.

Results

The frequency of prescribing Penicillins and Cephalosporins was 81.96%, Quinolones 32.81%, Metronidazole 17.88% and Aminoglycosides 10.71%. The prescribing frequency of Penicillins, Cephalosporins, Quinolones and Aminoglycosides are significantly higher in males ($P < 0.001$) when compared with females. Out of all antibiotics in our study, Cefotaxime is the most frequently prescribed antibiotic followed by ciprofloxacin.

Conclusion

In our present study, the combination of multiple antibiotics per prescription was very low and most of the patients did not know about the correct dosage of the drugs prescribed. The data presented here will be useful in future, long-term and more extensive drug utilization studies in the hospital and in promotion of rational prescribing and drug use in hospitals.

Keywords: *Defined Daily Dose; Drug Utilization; Antibiotics; In-patients.*

INTRODUCTION

Antibiotics are among the most commonly prescribed drugs in every tertiary hospital. Because of an overall rise in health care costs, lack of uniformity in drug prescribing, emergence of antibiotic resistance, monitoring and control of antibiotic use, are of growing concern. So strict antibiotic policies are warranted. Before such policies can be implemented, detailed knowledge of antibiotic prescribing practice is important.

Drug utilization research (WHO in 1977) is defined as "the marketing, distribution, prescription, and use of drugs in a society with special emphasis on the resulting medical, social and economic consequences"¹⁻³.

Since early 1960s the interest in Drug Utilization Studies has been increasing, first with market-only purposes, then for evaluating the quality of medical prescription and comparing patterns of use of specific drugs. Presently drug utilization studies are an evolving area. Their scope is to evaluate the present state and future trends of drug usage, to estimate crudely disease prevalence, drug expenditures, appropriateness of

prescriptions and adherence to evidence-based recommendations. The increasing importance of drug utilization studies as a valuable investigation resource in pharmacoepidemiology has been bridging it with other health related areas, such as public health, pharmacovigilance, pharmacoeconomics, eco-pharmacovigilance or pharmacogenetics.

Inappropriate drug use may also lead to increased cost of medical care, antimicrobial resistance, adverse effects and patient mortality^{4,5}. Hence in recent years studies on drug utilization have become a potential tool to be used in the evaluation of health systems⁶. The interest in drug utilization studies began in the early 1960s^{7,8} and its importance has increased since then because of increase in marketing of new drugs, wide variation in the pattern of drug prescribing and consumption, growing concern about delayed adverse effects and the increasing concern regarding the cost of drugs⁹⁻¹².

Defined Daily Dose (DDD) concept was developed to overcome objections against traditional units of measurement of drug consumption¹³. DDD is defined

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as the assumed average daily dose of a drug when used on its main indication in adults^{4,14,15}. The DDDs for the antibiotics are as a main rule generally based on the use in infections of moderate severity. However, some antibiotics are only used in severe infections and their DDDs are assigned accordingly. The DDDs assigned are based on daily treatment. The period of treatment is not taken into consideration. For antibiotics given in a high initial starting dose followed by a lower daily maintenance dose, the DDDs are based on the maintenance dose if the total duration of the treatment course is more than one week. However, if treatment course is shorter than one week, the DDDs are assigned according to the average daily dose, i.e., the total course divided by the number of treatment days. In this study, prescription pattern of antimicrobial drugs was undertaken upon patients in tertiary care hospital and also an effort was made to study the association of prescription data with age and sex.

MATERIALS & METHODS

During the period of 6 months study, we enrolled 16,121 prescriptions from in-patients wards of the tertiary hospital who were receiving antimicrobial drugs. The number of antimicrobial drugs prescribed in every prescription was taken into account to calculate the incidence of use of more than one antimicrobial agent. The prescriptions of the following antimicrobials were analysed: Penicillins, Cephalosporins, Tetracyclines, Aminoglycosides, Quinolones and Metronidazole.

Including Criteria: All in-patients with antibiotic prescribed in tertiary hospital

Excluding Criteria:

1. All out-patients in the tertiary hospital.
2. Children and pregnant women.
3. Patients taking multiple drug therapy.
4. Patients on anti-fungal, anti-TB and anti-Psychotic drugs.

The proforma included; age and sex (patient information), name of the drug and quantity prescribed (drug information). The quantity of drug was ascertained by the number of dosage units prescribed since one dosage unit denoted the form and strength in which the drug was dispensed. The analysis of age-sex frequency of antimicrobial drug prescribing was expressed for total group of drugs whereas analysis of prescribing frequency and DDD/1000/day were carried out for individual drugs. Prescribing frequency was expressed as a percentage of the number of prescriptions for each of the listed drugs out of the total number of prescriptions (16,121) during the study period.

Considering the adequacy of both duration of the study as well as sample size, the drug prescribing prevalence was expressed as DDD/1000/day.

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Total number of dosages
Units prescribed X Strength of each dosage unit X 1000

$$\text{DDD/1000/day} = \frac{\text{DDD X Duration X Total sample size of study}}{\text{DDD X Duration X Total sample size of study}}$$

DDD was calculated as per guidelines for ATC classification and DDD assignment (2010) as given by WHO collaborating centre for drug statistics methodology, Oslo, Norway¹³.

Males and females were separately divided into sex and age groups. The age - sex frequency of prescribing was calculated for each age group, each sex and each category of drugs. Statistical analysis to test the significance of the observed differences in the prescribing frequency between groups was performed by using the Chi Square test. P values less than 0.05 was considered significant.

Statistical analysis: SPSS version 17.0 (Statistical Package for Social Sciences Inc., USA) software package was used for data stratification and analysis.

RESULTS

The percentage incidence of use of more than one antimicrobial agent in 16,121 prescriptions was analysed in this study (Figure.1). Single antimicrobial treatment was maximum i.e., 50.13% of prescriptions, two drugs 29.72%, three drugs 15.8% and four drugs was 2.78% of prescriptions. The overall prescribing frequency for Penicillins and Cephalosporins was 81.96%, Quinolones 32.81%, Aminoglycosides 10.71%, Metronidazole 17.88%, Tetracycline 0.1% (Figure.2).

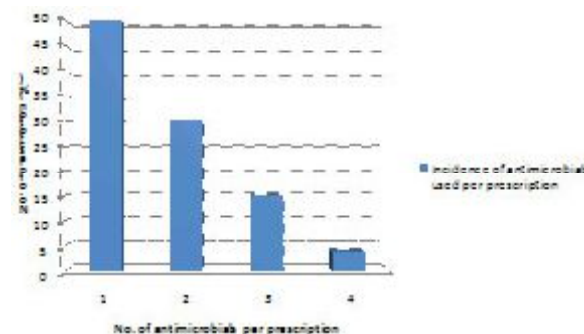


Fig. 1: Incidence of antimicrobials used per prescription

Among the males the percentage frequency of Penicillin and Cephalosporins was more in age group of 51 to 60yrs (73.7%) while in females with age group 11 to 20yrs, the percentage frequency of Penicillin and Cephalosporins was very high (88.3%).

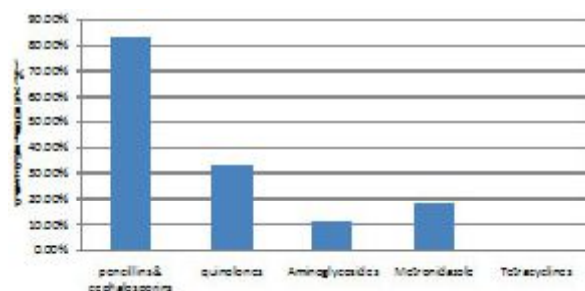


Fig. 2 : Prescribing frequency of five categories of Antimicrobial drugs in male & female patients

The prescribing frequency of Penicillins, Cephalosporins, Quinolones and Aminoglycosides are significant ($P < 0.001$) in males when compared with females; whereas, the same remained insignificant with other antimicrobials (Table 1). Cefotaxime, Ciprofloxacin, Ampicillin, Metronidazole and Gentamicin were most frequently prescribed while, Macrolides & Tetracycline were relatively least prescribed antimicrobials (Table 2).

Table 1 : Age-wise prescribing frequency for chosen anti-microbial drugs

Age group (yrs)	Total no. of patients	Penicillin & Cephalosporins	Quinolones	Aminoglycosides	Metronidazole	Macrolides	Tetracyclines
Males							
11-20	166	546	60	52	85	2	181
21-30	267	816	120	126	227	2	167
31-40	1937	937	100	95	159	2	180
41-50	1084	535	35	127	10	10	180
51-60	1186	585	147	125	159	10	180
61+	146	120	440	60	10	2	180
Total	3723	3120	2427	537	608	36	680
Females							
11-20	1082	520	270	419	552	10	180
21-30	2626	2611	750	432	657	10	180
31-40	1743	1662	430	252	348	10	180
41-50	1070	739	338	80	113	10	180
51-60	1050	810	478	148	243	20	180
61+	380	128	180	180	10	10	180
Total	9053	9654	2480	1009	1557	50	680

* $P < 0.001$ in males as compared to females

DISCUSSION

In our present study, the in-patient females population was more when compared to males population. Penicillin and Cephalosporins are consumed more in males with age group of 51 to 60yrs, this is because as the age advances the patient is susceptible to many infections while females consume more Penicillin and Cephalosporins in age group of 11 to 20yrs which may be due to various social causes like early marriages etc.,

The mean number of drugs per prescription must be as low as possible since higher figures always lead to increased risk of drug interaction, development of bacterial resistance and increased hospital costs^{16,17}. In this study, the prescribing frequency of antimicrobials per prescription is mostly one (50.13%) or two (29.72%). Cephalosporins and Quinolones were the most frequently prescribed antimicrobial drugs and their prescribing frequency was significant in males. Among

Table 2 : Prescribing prevalence of individual drugs

Drugs	DDD/1000/Day	Percentage of prescribing frequency
Ampicillin	2.89	22.55
Amoxicillin	16.89	7.76
Cloxacillin	8.54	7.63
Ceftriaxone	14.96	5.80
Cefotaxime	1.18	36.64
Cefuroxime	54.26	0.80
Cefixime	127.27	0.68
Cefoperazone	388.89	0.1
Ciprofloxacin	5.39	24.15
Gatifloxacin	47.61	3.65
Norfloxacin	36.26	2.39
Ofloxacin	47.61	1.82
Levofloxacin	217.05	0.80
Amikacin	47.61	1.82
Gentamicin	6.52	8.89
Azithromycin	53.41	1.94
Metronidazole	7.28	17.88
Tetracycline	221.05	5.89

the individual antibiotic drugs, maximum patients received Cefotaxime (36.67%), followed by Ciprofloxacin (24.14%), Ampicillin (22.55%), Metronidazole (17.88%), Gentamicin (8.89%) and Amoxicillin (7.74%). The prevalence of prescribing has been expressed as both DDD/1000/day and prescribing frequency. The DDD methodology does not indicate the exact number of patients who have been treated with a drug. This concept assumes that every person has been prescribed a particular drug is taking the specific DDD every day, ignoring the alteration of dosage by diseases and patient related factors. Further, the drugs prescribed for a brief period can have their prescribing prevalence underestimated¹⁸. Variations in dosage pattern, duration of study, the scattered population over different age groups etc., can therefore contribute to difference in audit reports using DDD methodology to determine prevalence of prescribing¹³.

In a developing country like India, patient compliance is primarily dependent on the cost of treatment. The poor patient compliance or non-compliance with medications is particularly important in clinical practice. It has been found to be associated with treatment failure and its all other consequences, namely, deterioration of patients' health, need for additional consultations, and use of extra drugs, additional hospital admissions and increase in direct and indirect costs of disease management¹⁹. Among the drugs reviewed, Cephalosporins and Quinolones are the examples of relatively expensive drugs and the patient compliance is likely to be poor for such medication. Prescribing drugs by their generic names may reduce the overall

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expenditure of the patients, especially on the newer antibiotics. But prescribing the antibacterial agents by their brand names, due to the influence of medicinal drug promotional activities may undermine some of the goals of essential drug concept.

The purpose of making this drug utilization study was to assess the use of drugs and to get the maximum possible representation of the patient population admitted in the in-patient wards of all the departments in tertiary care hospital with minimum interference to the prescribing physicians and the hospital administration.

CONCLUSION

The main challenges in prescription of antibiotics are to achieve a rational choice and appropriate use of antibiotics and to recognize their potential problems. Consequently, physicians must keep a clear understanding of need for microbiological diagnosis, use of antibiotics and make good judgement in clinical situations with available antibiotics²⁰. Improving patient's knowledge on correct dosage may perhaps boost up the present health care in this setting.

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