

## Pattern of drug utilization among outpatients in a teaching hospital of north India

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### ABSTRACT

Drug utilization study using prescribing indicators enables us to detect and also to quantify problems in prescribing practices. Such study helps to frame appropriate interventions based on type of problems and ultimately promotes rational use of drugs in the community. This descriptive study was undertaken at a recently started teaching hospital of rural area of Barabanki district of north India with objectives to generate the data on drug utilization of hospital and to suggest appropriate interventions in an attempt to rationalize the medical care provided by the practitioners of this hospital. The data collected from outpatient prescriptions were analyzed to calculate the average number of drugs per encounter and the other parameters of prescribing indicators. Prescribed drugs were categorized into different therapeutic groups to get pattern in drug prescribing. A total of 1101 patients were prescribed a total of 2942 drugs. The average number of drugs per encounter was 2.6. Antibiotics, non-steroidal anti-inflammatory drugs, antihistaminics, drugs for acid peptic disorders and multivitamins were five most commonly prescribed therapeutic groups. Encounters with an antibiotic were approximately 42%. Only 12.6 % drugs were prescribed by generic name and approximately 42% drugs matched with essential drugs list. Polypharmacy, over-prescribing of antibiotics, prescribing by brand name and out of formulary are some of the important problems that seek proper attention of the practitioners. Institution of hospital formulary, strict antibiotic prescribing policy and educational interventions can help to rectify these problems.

**Keywords:** Drug utilization, generic prescribing, prescribing practices, teaching hospital

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### INTRODUCTION

Drug utilization research has been defined by the World Health Organization (WHO) as "the marketing, distribution, prescription and use of drug in a society, with special emphasis on the resulting medical, social and economic consequences" [1]. Such study is considered as an essential part of pharmacoepidemiological study that describes the extent, nature and determinants of drug use. There are two different parts of this study i.e. descriptive and analytical. The descriptive part of drug utilization study describes the pattern of drug utilization and identifies problems in drug use that deserve more detailed

studies. The main aim of drug utilization study is to facilitate the rational use of drugs [2]. Rational use of drugs requires that " patients receive medication appropriate to their clinical needs, in doses that meet their individual requirement for an adequate period of time and at the lowest cost to them and their community" [3]. Rational prescribing is an important determinant in drug supply-use chain that contributes much to rational use of drugs. However, irrational prescribing has been reported as a global problem from the teaching as well as non-teaching hospitals [4-6]. Reports coming especially from the

teaching hospitals are the most unfortunate part of such observations, as they are the role models for the future physicians and they have the special responsibility towards society to promote rational prescribing and use of drugs by their staff and through these, by generation of future physicians. This is the real scenario in spite of an effort started by the WHO far early in 1985 in the form of a global conference of experts held at Nairobi to promote rational prescribing. The irrational prescribing habits often result as inadequate therapeutic response, iatrogenic illnesses, emergence of drug resistance to antimicrobials, increased cost of treatment and after all paucity of therapeutic resources. They also make the prescribers vulnerable to influences which can cause irrational prescribing such as patient pressure, bad examples of colleagues and high-powered salesmanship [7].

It is extremely important to describe and quantify the problem before initiatives are taken to promote rational use of drugs. Prescriptions are good source of information to determine prescribing indicators. The prescribing indicators are one of the core drug use indicators developed by the WHO in collaboration with the International Network for Rational Use of Drugs (INRUD) that enables us to measure the magnitude of most important types of problems in prescribing practices and drug use such as polypharmacy, unnecessary use of branded products, overuse of costlier forms of treatments i.e. antibiotics and injections and non-adherence to institutional or national formularies [8]. These quantitative indicators are widely accepted as the global standard for problem identification and to make comparisons between regions or countries or to measure the impact of interventions [9]. Such indicator based study helps us also to prioritize problems and to focus subsequent efforts to rectify them accordingly. If such study is conducted periodically, it helps to promote rational use of drugs. Polypharmacy, overuse of antibiotics and lower use of generic name were reported in various study conducted in India [10-12].

Since the Hind hospital has been started as a teaching hospital only in the recent past, authors were unable to get the data on prescribing indicators and drug utilization pattern of this hospital. It was thought pertinent to conduct this study at this teaching hospital taking into consideration the coming reports of irrational prescriptions and important role of such institutions in generation of competent future physicians. Therefore this preliminary preinterventional study was planned and undertaken with objectives to generate baseline data on prescribing indicators, to delineate existing problems in prescribing practices, to frame appropriate interventions accordingly and to provide feedbacks to practitioners so as to make their practice more rational and cost-effective. The base line data generated by this study could also provide the basis for further studies by the future investigators in a direction to optimize the use of drugs.

#### **MATERIALS AND METHODS**

This is a pharmacy based cross sectional descriptive study conducted at Hind hospital. Hind hospital is a 700 hundred bedded teaching hospital of Hind Institute of Medical Sciences, Barabanki (Uttar Pradesh.) located in the north India. This is a multi-specialty hospital providing tertiary care health facilities to people of Barabanki and its neighboring districts. Only freshly registered outpatients with their prescriptions belonging to all age and both sex from all clinical departments were included to get the prospective data for this study. Prescriptions with instruction to indoor admission and that of follow-up cases were not considered for this study considering the complexity of such drug prescriptions. Patients included in this study were approached for their prescriptions at hospital pharmacy on a fixed day in each week. Patients were explained the purpose of the study prior to get their prescriptions and written consent was taken from each patient included in this study. A specially designed proforma consisting columns of an ideal prescription paper were used to record the data from original prescriptions. The data collected by this method from 1101 original prescriptions were strictly analyzed under

WHO guidelines as mentioned in "How to investigate drug use in health facilities" [13] to find out the prescribing indicators. The prescriptions were analysed also to find out the distribution of prescriptions according to number of drugs prescribed, the distribution of drugs prescribed as per their therapeutic groups and the most frequently prescribed individual drugs. The fixed dose ratio combination (FDC) drugs were counted as one single drug. Anti-tubercular, anti-leprotic and anti-protozoal drugs especially metronidazole and tinidazole were not counted as antibiotics as per the instructions of WHO. The average and the mean $\pm$ SD (Standard Deviation) number of drugs per encounter were calculated. The percentages of encounters with an antibiotic and with an injection were calculated. All the prescribed drugs were compared to those enlisted in the current National List of Essential Medicines of India

(2003) to find out the extent of deviation from this list [14]. The number and percentage of FDC drugs and drugs prescribed by generic name were counted and calculated. All prescribers were having MBBS or above degree. The study was conducted over last six months period in 2009. The proper permission and approval were taken from the institutional research review and ethics committee prior to commencement of this study. The total, average and mean  $\pm$  SD number and percentage were used to describe the obtained data.

### RESULTS

A total of 1101 patients were prescribed a total of 2942 drugs. The mean  $\pm$  S.D. number of drugs per encounter was found to be 2.6 $\pm$ 1.1 with a range of 1 to 6 drugs. More than fifty percent patients (n = 578, 52.5%) were prescribed more than two drugs (**Table 1**).

**Table 1: Distribution of prescriptions according to number of drugs prescribed**

No. of Drugs Per Prescription	No. (%) of Such Prescription
1	135 (12.3)
2	388 (35.2)
3	362 (32.9)
4	152 (13.8)
5	047 (4.3)
6	017 (1.5)

The most frequently prescribed therapeutic groups of drug in decreasing order were antibiotics with 538 (18.3%) drugs, non-steroidal anti-inflammatory drugs (NSAIDs) including paracetamol with 479 (16.3%) drugs, anti-histaminics with 274 (9.3%) drugs, drugs for acid peptic

disorders with 264 (9.0%) drugs and multi-vitamins with 234 (8.0%) drugs. These five therapeutic groups of drugs accounted for 60.9% of the total drugs prescription. Other common therapeutic groups were anti-fungals, corticosteroids, anti-protozoals, psychotropics etc. (**Table 2**).

**Table 2: Distribution of prescribed drugs according to their therapeutic group**

S.N.	Therapeutic Group	No. (%) of Drugs
1	Antibiotics	538 (18.3)
2	NSAIDs	479 (16.3)
3	Anti-histaminics	274 (9.3)
4	Drugs for Acid-Peptic Disorder	264 (9.0)
5	Multivitamines	234 (8.0)
6	Anti-fungals	136 (4.7)
7	Corticosteroids	103 (3.5)
8	Anti-protozoals	102 (3.5)
9	Anti-depressants	74 (2.5)
10	Psychotropics	70 (2.4)

11	Anthelmintics	69 (2.3)
12	Hypnotics & Sedatives	58 (2.0)
13	Nasal Decongestants	50 (1.7)
14	Cough & Cold Remedies	32 (1.1)
15	Anti-emetics	24 (0.8)
16	Anti-spasmodics	24 (0.8)
17	Antiseptics	21 (0.7)
18	Haematinics	20 (0.7)
19	Bronchodilators	19 (0.6)
20	Antihypertensives	19 (0.6)
21	Miscellaneous	334 (11.3)
22	Total	2942 (100)

The most frequently prescribed individual drug in decreasing order were cetrizine (194), diclofenac (122), ranitidine (96), amoxicillin (88), omeprazole (86), combination of ibuprofen + paracetamol (86), ciprofloxacin, nimesulide and Vit.B-

Complex (**Table 3**). Other commonly prescribed individual drugs were pantoprazole, albendazole, paracetamol, amitriptyline, azithromycin and combination of Ampicillin + cloxacillin.

**Table 3: Top ten commonly prescribed individual drugs**

S.N.	Individual Drug	No. (%)
1	Cetrizine	194 (6.6)
2	Diclofenac	122 (4.1)
3	Ranitidine	96 (3.3)
4	Amoxycillin	88 (3.0)
5	Omeprazole	86 (2.9)
6	Ibuprofen + Paracetamol	86 (2.9)
7	Ciprofloxacin	77 (2.6)
8	Nimesulide	76 (2.6)
9	Vit. B-Complex	75 (2.5)
10	Pantoprazole	69 (2.3)

The FDC drugs were found to be 679 (23.08 %) among all. Out of 2942 drugs, only 371 (12.6%) drugs were prescribed by their generic name and brand names were used for prescribing a significant percentage (87.4 %) of drugs. The prescription

encounters with an antibiotic were 462(41.96 %) and with an injection were 46(4.17 %). Drugs prescribed from essential drugs list were 1213(41.23 %) (**Table 4**).

**Table 4: Prescribing core drug use indicators**

S.N.	Indicators	No. (%)
1	Average No. of Drugs per Encounter	2.6 (--)
2	Drugs prescribed by Generic Name	371 (12.6)
3	Encounters with an Antibiotic	462 (41.96)
4	Encounters with an Injection	46 (4.17)
5	Drugs prescribed from EDL	1213 (41.23)

## DISCUSSION

The average number of drugs per encounter is an index to measure the degree of polypharmacy. Though there is no exact line in between the rational and the irrational

number of drugs per encounter, the average number of drugs per encounter should be below two as per WHO [8]. This number in our study was found to be 2.6, which represents a higher figure than those

suggested by the WHO and those reported from the other teaching hospitals of India [10, 11] and that of western Nepal [15], Saudi-Arabia [16], Sudan [17] and Ethiopia [18], where this value ranged from 0.9 to 2.1. The average number of drugs per encounter observed in our study therefore suggests the practice of polypharmacy. This is also evidenced by high proportion of prescriptions (52.5 %) with more than two drugs. Polypharmacy might have been contributed in our study by irrational prescribing of more than one antibiotic or NSAID or anti-histaminic to same patient. Polypharmacy has been associated with many drug related problems including increased drug interactions, increased cost of treatment, non-compliance and prescribing and dispensing errors [19, 20]. Therefore the number of drugs per prescription should be kept as low as possible.

The five most frequently prescribed groups of drug in our study were antibiotics, NSAIDs, anti-histaminics, drugs for acid peptic disorders and multi-vitamins. This trend of prescribing therapeutic groups is almost in conformity with those observed in other similar study of south India [5] and that of western Nepal [15] and Saudi-Arabia [16]. Antibiotics, NSAIDs and vitamins were the commonly prescribed therapeutic groups among outpatients in one another study of India [11]. Antibiotics were prescribed in significant proportion also among outpatients of the teaching hospitals of Ethiopia (38.1%) [18] and Pakistan (20.4%) [21]. The WHO states that more than 30% encounters with one or more antibiotic prescribed should be taken as overuse of antibiotics and a problem in prescribing practices [8]. The encounters with antibiotic in our study were found to be around 42%. This represents a better figure as compared to those reported from Sudan [17] and a far better figure than those reported from outpatients of Nigeria [22], where this value were 65% and 83.2% respectively. However our observed value is not better than that reported from western Nepal [15] where only 26.4% encounters were found to have antibiotic. Therefore our study as well as other studies except that of western Nepal confirms the ongoing

overuse of antibiotics in developing countries. This can be attributed to the fact that most of the population in the developing countries exists under conditions of poverty, inadequate medical care, poor sanitation and nutrition where bacterial infections account for much of the morbidity and mortality [23]. However, the excess use of antibiotics should be discouraged on account of the risk of development of resistance, adverse drug reactions and increased cost of treatment. Among the list of top ten commonly prescribed individual drugs, cetirizine was at the top followed by diclofenac but combination of paracetamol and ibuprofen and nimesulide also occupied the place in this list. Amoxicillin followed by ciprofloxacin were most commonly prescribed individual antibiotics as is evident from this list. Ranitidine was the most commonly prescribed individual drug for acid peptic disorder followed by omeprazole and pantoprazole in this list. Almost all these drugs were also pointed out as commonly prescribed individual drugs in the study of western Nepal [15]. Amoxicillin was the most frequently prescribed individual antibiotic in a similar study conducted in a different location of south India [10]. Amoxicillin and ciprofloxacin were among the most frequently prescribed antibiotics in a similar Nigerian study [22]. Thus our as well as other national and international studies suggest the widespread use of amoxicillin and ciprofloxacin. The prescribing pattern of therapeutic groups and individual drugs in our study points towards the need of further study on disease pattern at our hospital to confirm the need of their prescribing. The percentage of FDCs among all the prescribed drugs in our study was around 23%, which is comparatively more than those observed among outpatients in other teaching hospital of south India (21.9%) [5] and that of western Nepal (15.8%) [15]. Prescribing FDCs may improve the compliance but they may not contain the required dose of each single drug and even they may not be more effective than the individual drugs given alone. On the other hand combining the individual drugs in the

same formulation increases the risk of adverse events. Therefore prescribing FDC drug is justified only when the combination offers the advantages in terms of its established efficacy, safety and compliance for the given condition [24]. The prescribing of FDCs in such a proportion in our study is a matter of concern and the rationality for prescribing combination products needs to be investigated so that appropriate measures may be taken timely to prevent this wrong practice.

The percentage of encounters with an injection is taken as the measure of overuse of this costly form of drug treatment [13]. Injection exposes the internal organs of patients for surface and external infections as an undesirable consequence of therapy. In our study, the encounters with injection were found to be 4.17%. Though this value is higher in comparison to those observed at western Nepal (0.96%) [15] and south Indian (2.58%) [12], it is better than those reported in similar studies from Sudan [17] and Nigeria [22], where these values were 10.5% and 14% respectively. The WHO permits up to 10% of encounters with an injection [8]. Therefore, our finding in this regard is satisfactory.

Prescribing drugs using generic name contributes to reduction in the cost of treatment and provides more options to pharmacists for dispensing appropriate drugs to patients. This also prevents the possible dispensing errors that arise due to abundance of confusing brand names available for different groups of drugs. These are the reasons because of which, prescribing by generic name has been regarded as an important tool to promote rational use of drugs by the WHO. Prescribing of drugs by generic name in teaching hospital of south India [5, 10, 12], western Nepal [15], Sudan [17], Pakistan [21] and Ethiopia [25], were reported to be in a range of 13.3% to 96.5%. Drug prescribing by generic name in our study was only 12.6%, which is a low figure in comparison to other studies. This suggests that physicians in our hospital are inclined more for branded drug products. This may be due to their unawareness regarding the benefits of prescribing by generic name or due to highly influenced marketing

strategies of the pharmaceutical companies or both.

Essential drugs are selected with due regard to disease prevalence, evidence of efficacy as well as safety and comparative cost-effectiveness. Therefore, prescribing drugs from the essential drugs list (EDL) is also documented as a tool to promote the rational use of drugs. The percentage of drugs prescribed from the EDL in our study was 41.2. This is slightly better value than those reported from western Nepal (39.6%) [15]. However, this is a significantly lower value than those reported from other Indian study (60.98%) [12] and that of Pakistan [21] and Ethiopia [25], where these values were 80% and 70% respectively. Though this figure may be lower in teaching hospitals due to more complex pattern of diseases presenting to them, the importance of use of EDL as hospital formulary in the setting of teaching hospital can not be omitted at all taking care the advantages of its use. The unavailability of hospital formulary or national list of essential drugs list was one known reason of such poor performance in our study and other possible reasons behind such deviation should be explored. As this study was conducted only over six months, the possibility of bias due to seasonal variation can not be excluded. A complete one year study could have more comprehensive results.

#### **CONCLUSION**

This study reveals various problems in prescribing practices in different magnitude. Prescribing by generic name and that from national essential drugs list is remarkably low. Polypharmacy, overuse of antibiotics and prescribing of injudicious fixed dose ratio combination drugs are other problems of concern. The continued medical education (CME) program aimed at particular prescribing problem, the introduction and implementation of institutional formulary and standard treatment guidelines along with strict prescribing policy for antibiotics are recommended as optimum interventions to minimize these problems.

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