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Research Article

A PRESCRIPTION AUDIT AND ASSESSMENT OF DRUG UTILIZATION PATTERN IN A TERTIARY CARE TEACHING AND REFERRAL HOSPITAL IN UTTAR PRADESH, INDIA

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ABSTRACT

Objective: The objective of our study is to assess the prescription and drug utilization pattern in a tertiary care teaching and referral hospital in Uttar Pradesh, to investigate the rational use of drugs.

Methods: The study was carried out in the general medicine outpatient department (OPD) setting for a period of 3 months in our tertiary care teaching and referral hospital. The prescriptions were randomly sampled and the photocopies of all the prescriptions were obtained from the OPD during the period of the study and were processed and analyzed for the demographic profile, drug profile, fixed-dose combinations, therapeutic classes of antibiotic prescribed, morbidity profile according to the disease pattern, and prescription pattern including the errors in prescription and the assessment of polypharmacy.

Results: A total of 350 prescriptions were randomly sampled, out of which 312 prescriptions were fit to be analyzed. The total number of drugs in 312 prescriptions was 1022. Basic information of patient was written in 79.25% prescriptions, 84.25% prescriptions were legible, and only 71.21% prescriptions were complete. The majority of prescriptions had at least five drugs ordered which constituted around 43.14% of total number of prescriptions leading to polypharmacy.

Conclusions: Our study highlights that there is a scope for improvement in prescribing patterns in areas of writing legible and complete prescriptions. To lay down the principles of rational pharmacotherapeutics, proper training of the prescribers on rational prescription writing is the need of an hour for improving the quality of prescriptions.

Keywords: Prescription auditing, Drug utilization pattern, Rational prescription, Polypharmacy.

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INTRODUCTION

The prescription order written by an authorized person is a medicolegal document which is an important link between the doctor and the patient. Various prescribing errors are a direct result of irrational drug prescribing habits, which are now prevailing in a majority of health-care settings. According to the World Health Organization (WHO), "the rational use of drugs requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community" [1].

Bad prescribing habits include misuse, overuse, and underuse of medicines, which can lead to unsafe treatment, health hazards, and economic burden on the patients and wastage of resources. Prescribing errors promote the irrational use of drugs and decrease the patient compliance [2]. Such practices also lead to the emergence of drug interactions, drug resistance and adverse drug reactions, which increase mortality, morbidity, and financial burden on the patient [3]. Drugs in the prescriptions are also often written without knowledge about the relevance or potential hazards of polypharmacy [4].

Prescription auditing is a quality improvement process that seeks to improve patient care and outcomes through a systematic review of care against explicit criteria and the implementation of change. This vigilance activity is beneficial in clinical practice in terms of reducing the burden of disease because of medication errors [5].

Prescription auditing involves critical analysis of how the prescription is written as compared to the internationally accepted criteria given by the WHO as a guide for good prescription writing [6]. A set of core prescribing indicators is formulated by the WHO for the rational use of drugs. This set includes the prescribing indicators, the patient care indicators, and the facility indicators. The prescription auditing studies are been conducted in different settings all over the world based on the above prescribing indicators [7,8].

The primary aim of the prescription auditing studies is to improve the quality of health care being provided in various health-care settings. As per our knowledge, no study has been conducted in our outpatient facility, so this study was done to measure the health-care indicators by obtaining the data for rational drug use.

Objectives

The objectives are as follows:

1. To analyze the prescription profile so as to determine the total number of drugs prescribed and to calculate the average number of drugs ordered per prescription, to measure polypharmacy
2. To analyze the prescriptions for the major classes of drugs prescribed, percentage of generic and fixed-dose combinations, number of drugs taken from the essential drug list (EDL) including the completeness of prescription in all respects and legibility.

METHODS

Study design and site

The present study is a prospective outpatient department (OPD)-based study which was carried out in the medicine department of Era's Lucknow Medical College and Hospital, Lucknow, Uttar Pradesh, India.

Study duration

The study was conducted over a period of 3 months.

Study procedure

Doctors and health-care providers were informed regarding the aims, objectives, and methods of the study with the help of certain information sheets, which are designed mainly for the purpose of the study. Photocopies of all the prescriptions were obtained from the medicine OPD on their specific OPD days during the period of the study. The prescriptions collected from the doctors were analyzed using a spreadsheet with the WHO core drug prescribing indicators, on the basis of the following parameters.

- General details of the prescriber
  - Name of the prescriber
  - Contact number and address of the prescriber
  - Designation.
- General details of the patient
  - Name
  - Age
  - Sex
  - Address.
- Date of consultation
- OPD registration number
- Legible handwriting
- Generic name of the drug
- Dosage form of the drug
- Strength of the drug
- Correct dose
- Frequency of administration
- Duration of treatment
- History including chief complains of the patient
- Presumptive/definitive diagnosis
- Investigations
- Number of drug items written on the prescription
- Number of antibiotics prescribed
- Number of injections prescribed
- Total number of drugs prescribed for the EDL
- Legible signature
- Medical council registration number.

The data obtained were processed with the help of Microsoft Excel and were analyzed using SPSS version 25.0.

RESULTS

Out of 350 prescriptions collected, only 312 stood appropriate for analysis. All of them had patient name mentioned, but the other basic and necessary details were missing. Age and sex of the patient, OPD registration number and prescribers' details were not documented in some of the prescriptions. The total number of drugs prescribed in 312 prescriptions was 1022. Therefore, average number of drugs per prescription is 3.27.

Demographic profile of the patient was found to be as follows – age distribution of infants (0–1 years) was 6.25%, toddlers (2–5 years) was 3.88%, children (6–9 years) was 8.12%, adolescent (10–19 years) was 10.02%, adults (20–60 years) was 59.7%, and elderly (>60 years) was only 5.6% (Fig. 1). There were 62.32% males and 33.12% female patients (Fig. 2). Age was not documented in 6.43% of prescriptions. Sex was not mentioned in 4.56% of cases.

Drugs prescribed by generic names constituted only 4.12% of cases. In 35.27% of cases, fixed-dose combinations were used. Fixed-dose combinations of amoxicillin with clavulanic acid were ordered in majority of prescriptions, i.e., 4.12% which was followed by antipyretic, analgesic, and serratiopeptidase combination constituting to 22.65%, followed by multivitamins 18.15%, beta-blockers with calcium channel blockers 6.40%, and mucolytics with bronchodilators 5.97%, and the combination of norfloxacin with tinidazole was used the least which was in only 5.71% of cases. In 5.12% of cases more than one antibiotic was prescribed. Only 84.25% prescriptions were legible and only 50.81% prescriptions were complete with respect to dose,

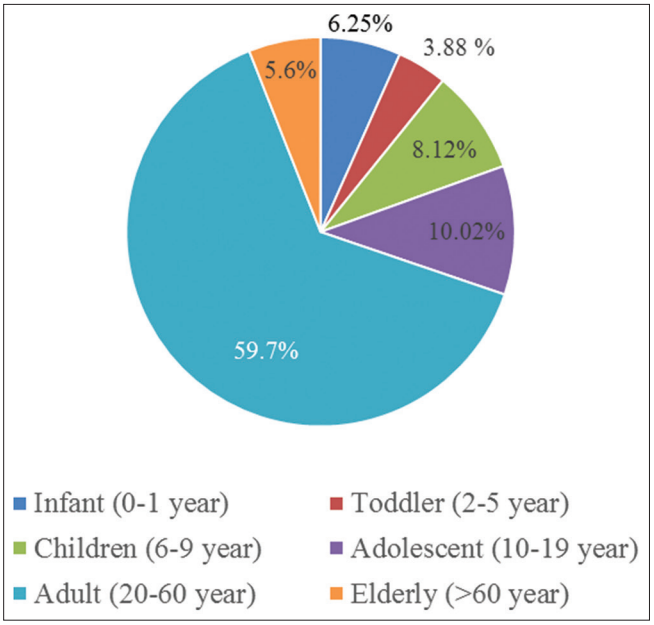

Fig. 1: Age distribution of patients

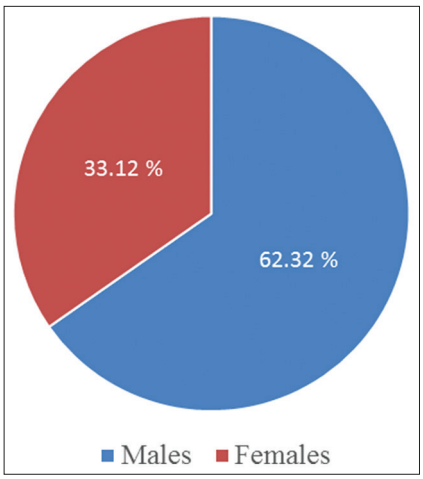

Fig. 2: Sex distribution of patients

dosage forms, frequency, and route of administration mentioned on the prescription (Table 1).

Only 51.75% of drugs out of the total number of drugs were ordered from the EDL. The majority of medications, i.e., 91.62% were prescribed in their oral dosage forms followed by injectables which were 5.13% and also the topical dosage forms which constituted only 3.25% of total number of drugs. The majority of drugs which were prescribed were antibiotics which were approximately 32.22%. Antibiotics belonging to the cephalosporin class of drugs were prescribed most commonly, accounting to 60.15%. Macrolides prescribed were around 21.22% of the total antibiotics, followed by penicillin group, quinolones, and the least reported were aminoglycosides constitute only 1.34% of total antibiotics ordered. This was followed by nonsteroidal anti-inflammatory drugs (NSAIDs), cardiovascular drugs, expectorants and bronchodilators, anti-ulcer drugs, antihistaminic drugs, and the least which were prescribed which were the mineral and enzymes only 8.11% of total drugs. Thus, a variable drug prescribing pattern is shown in Table 2.

In all the prescriptions analyzed, the maximum duration of treatment which was advised to the patients was of 3–5 days in around 40.12%

Table 1: Prescription profiles

S. No.	Parameters	No. of prescriptions (%)
1.	Drugs prescribed by generic names	12 (4.12%)
2.	Fixed-dose combinations	110 (35.27)
a.	Combination of antipyretic, analgesic and serratiopeptidase	25 (22.65)
b.	Combination of mucolytics and bronchodilators	7 (5.97)
c.	Combination of beta blockers and calcium channel blockers	7 (6.40)
d.	Combination of amoxicillin and clavulanic acid	45 (41.12)
e.	Combination of norfloxacin and tinidazole	6 (5.71)
f.	Multivitamins	20 (18.15)
3.	Antibiotics prescribed >1 per prescription	15 (5.12)
4.	Legible prescriptions	263 (84.25)
5.	Complete prescriptions	159 (50.81)

Table 2: Drug profiles

S. No.	Parameters	Number of drugs (%)
1.	Drugs on EDL	528 (51.75)
2.	Dosage forms	
a.	Oral drugs	937 (91.62)
b.	Injectables	52 (5.13)
c.	Topical drugs	33 (3.25)
3.	Antibiotics prescribed	329 (32.22)
a.	Cephalosporins	198 (60.15)
b.	Macrolides	70 (21.22)
c.	Penicillin	40 (12.12)
d.	Quinolones	17 (5.17)
e.	Aminoglycosides	4 (1.34)
4.	NSAIDs	205 (20.12)
5.	Anti-ulcer drugs	94 (9.18)
6.	Antihistaminic drugs	86 (8.42)
7.	Expectorants and bronchodilators	108 (10.53)
8.	Cardiovascular drugs	117 (11.42)
9.	Minerals, enzymes, and miscellaneous	83 (8.11)

EDL: Essential drug list, NSAIDs: Nonsteroidal anti-inflammatory drugs

of cases, followed by 6–7 days in 27.01% cases, 8–10 in 11.08% cases, and even more than 10 days in 10.5% of cases. In only 9.17% of cases the treatment was of a shorter duration of 1–2 days, and a single dose of treatment was only reported in a mere 2.12% of cases (Table 3).

Majority of presumptive or definitive diagnosis which was encountered was related to the digestive system which was in around 45.77% of cases, followed by the diseases of respiratory system were 20.19%, cardiovascular system 12.52%, and infectious and parasitic infestations 10.04%. The least common diagnosis mentioned was pertaining to the diseases of musculoskeletal system, central nervous system, and skin. About 2.12% of burn and trauma cases were also reported (Table 4).

Certain common errors were reported in the majority of prescriptions analyzed, which were related to incomplete prescriptions like in some cases the basic and foremost details of the patients such as their age and sex were not written, others even lack probable or definitive diagnosis. There were some prescriptions wherein date, OPD registration number, even the details, and legible signature of the doctor were not mentioned (Table 5).

In many prescriptions, there was excessive number of drugs prescribed, which was inappropriate and led to polypharmacy. The maximum number of drugs prescribed reported was seven and more in 10 (3.08%) cases, and majority of the prescriptions analyzed did have at least five

Table 3: Treatment duration profile

S. No.	Duration	Number of prescriptions (%)
1.	Single dose	6 (2.12)
2.	1–2 days	28 (9.17)
3.	3–5 days	125 (40.12)
4.	6–7 days	84 (27.01)
5.	8–10 days	34 (11.08)
6.	>10 days	33 (10.5)

Table 4: Morbidity profile

S. No.	Disease pattern	No. of prescriptions (%)
1.	Diseases of digestive system	142 (45.77)
2.	Diseases of respiratory system	62 (20.19)
3.	Infections and parasitic infestations	31 (10.04)
4.	Diseases of skin	4 (1.51)
5.	Diseases musculoskeletal system	10 (3.12)
6.	Diseases of cardiovascular system	39 (12.52)
7.	Diseases of the central nervous system	14 (4.73)
8.	Burn and trauma cases	6 (2.12)

Table 5: Common errors in prescriptions

S. No.	Error	No. of prescriptions (%)
1.	Age of the patient not written	25 (8.12)
2.	Sex of the patient not written	18 (5.85)
3.	Date not written	6 (2.12)
4.	Diagnosis not written	34 (11.12)
5.	Name and address of the doctor not mentioned	16 (5.23)
6.	OPD registration no. not mentioned	16 (5.18)
7.	Duration of treatment not mentioned	14 (4.45)
8.	Legible signature of the doctor is absent	22 (7.12)
Total prescriptions with errors		151 (49.19)

OPD: Outpatient department

drugs ordered in them, which constituted to around 135 (43.14%) of total prescriptions (Fig. 3).

DISCUSSION

Prescription writing is a mode of the therapeutic intervention for the patient by the doctor and this skill is acquired through training. It is the legal duty of the practitioner to write legible and complete prescriptions, as the quality of prescriptions directly reflects the competence of physician and his efficiency of rational prescribing.

However, systematic reviews suggest that prescribing errors are common and can affect from 4.2 to 82% of prescriptions [9]. These prescribing errors can also cause adverse effects. Almost four in 1000 prescriptions have errors having the potential to cause adverse reactions [10]. Individual and system-related factors are responsible for prescribing errors [11]. Systematic analysis of prescriptions can identify these errors by prescription auditing [12]. Prescription auditing is the mainstay of quality assurance in hospitals, as the audit data which are collected are of much importance to the hospital administration, health-care professionals and drug manufacturers as the data are worthy in making better decision and drafting specific policies.

In our study, the total number of drugs analyzed in 312 prescriptions was 1022. Therefore, average number of drugs per prescription is 3.27. This number is quite higher than the recommended limit for the

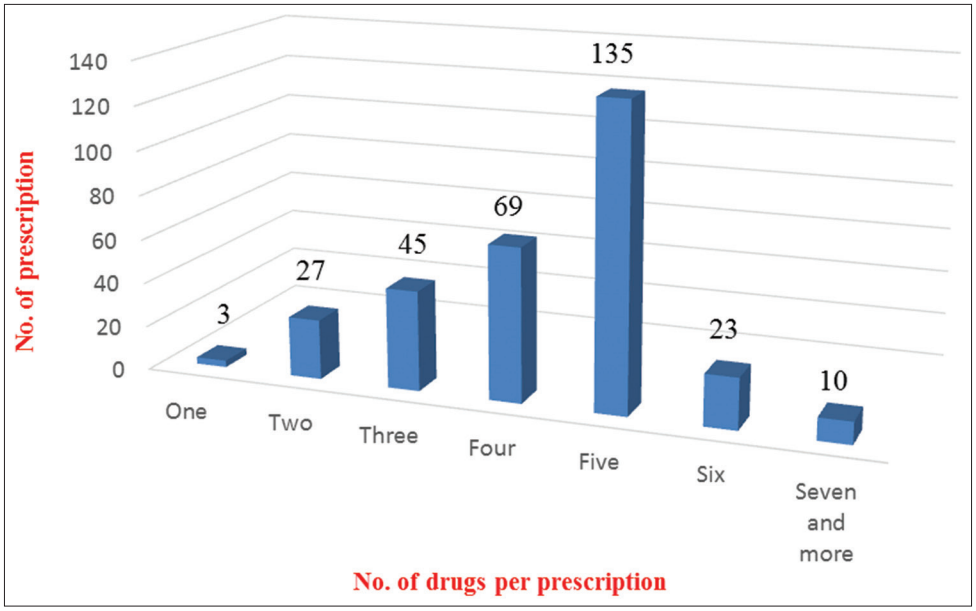

Fig. 3: Polypharmacy

average number of drugs to be prescribed per prescription that is 2.0. The almost same finding was noticed in a study done by Senthilselvi *et al*. where an average number of drugs per prescription was 4.29 which is greater than double the average number (i.e., 2) recommended by the WHO [13]. The risk of drug interactions is directly proportional to the increase in average number of drugs per prescription. Rational pharmacotherapeutics can play a great role in this regard if introduced.

Some brand names (proprietary names) and generic names (non-proprietary names) sound or appear to be similar to certain other drugs when spoken or written. These are known as look-alike-sound-alike medications. With thousands of similar drugs currently present in the market, this confusion can be a leading cause of medication error, which could be harmful or even can be proved fatal to the patient. This is only because these drugs have names which appear similar, when are carelessly written, liable to misinterpretation. There are certain examples of confused drug name pairs such as losec (omeprazole) and lasix (furosemide), Celebrex (celecoxib) and Cerebyx (fosphenytoin), almarl (arotinolol) and Amaryl (glimepiride), and Lantus (insulin glargine) and Lanvis (thioguanine), which are problematic worldwide. Proper prescription auditing can avoid or decrease this confusion or misinterpretation caused by illegible prescribing.

Based on the findings in our study, certain prescription practices need improvement as soon as possible. As to quote an example in some of the prescriptions, age, sex, address, and OPD registration number were missing. In others, prescribers' initials were not found. These errors make the prescription invalid, as certain drugs can only be dispensed with a valid prescription of the doctor. The prescription errors analyzed by our study were in correlation with errors found in another study done by Ahsan *et al*. where 17% of prescriptions lack the initials of the prescriber [9], leading to serious dosing and dispensing errors. In a study done by Seden *et al*., it has been suggested that electronic prescribing can eliminate these errors through cautions and alerts at the time of prescribing drugs [14].

In this study, the drugs prescribed by generic names are only in 4.12% of cases, which are quite less. As if drugs are prescribed with their generic names, there are reduced chances of dispensing errors, decreased economic burden on the patients, and less undue wastage of resources. Drugs on EDL are only 51.75% of drugs are on EDL, which is comparable to another study done by Hazra *et al*., in India [15].

Dosage forms which were used constituted to around 91.62% oral, 5.13% injectables, and 3.25% topical forms. Injections were prescribed in 5.13% of encounters, which is in accordance with the accepted range as proposed by the WHO (≤10%), similar to a study done by Abidi *et al*. in a hospital of Western UP, India [5]. Prescribing injectable in cases where oral dosage forms are more beneficial and appropriate, is an irrational deed as the cost of the injections is much higher as compared to the oral forms. Inappropriate and unnecessary use of injectables also increases the risk of HIV and other blood-borne injections [16].

The antibiotics prescribed were around 32.22%, which is higher than the designated range by the WHO (≤30%). The percentage of encounters was around 39%, which was comparable to a study done by Ahsan *et al*. [9]. More than one antibiotic is prescribed in 5.12%% of cases. This finding was similar to a study done by Gupta *et al*., where majority of patients received more than one antibiotic [17]. Overuse of antibiotics due to their over prescription is leading to a greater increase in antibiotic resistance. About 29.63% of prescriptions had fixed-dose combinations, which is quite greater when compared to another study done in India by Chakrabarti [18].

Complete prescriptions reported related to dosage form, dose, frequency, route of administration, patient's and prescriber's details and other necessary information were only 50.81%, and only 84.25% of prescriptions were legible. One hundred fifty-one prescriptions (49.19%) out of 312 analyzed had common errors of prescribing.

Polypharmacy which is the unnecessary administration of an excessive number of drugs and medicines at the same time is regarded as the chief form of malpractice among prescribers, and it was also documented to some extent in this study. A majority of prescriptions (43.14%) analyzed had an order of five drugs prescribed which is quite larger as compared to a study done by Balaji *et al*. where the percentage of prescriptions containing more than five drugs was 3.8%, a significantly lower percentage than our study [19]. Study done by Siddarama *et al*. has also shown results with prescriptions that contain more than 6 drugs in 91.57% of prescriptions [20].

There were also certain prescriptions, though less in number (3.08%) in which seven and more drugs were ordered. The average consultation time with the doctor is 3.2 min, which is the time taken by the patient from entering the doctor's room for consultation to leaving it which is a very short period assigned for the total process of consultation, which mainly involves taking a proper history including the chief complaints, clinical evaluation, and prescribing appropriate drugs. The time for dispensing the drug is 1.8 min, which is also insufficient as more

dispensing time should be given to the pharmacist so that they could deliver the right drug.

Most common categories of drug prescribed to the patient were antibiotics 32.22%, NSAIDs 20.12%, cardiovascular drugs 11.42%, anti-ulcer drugs 9.18%, antihistaminic 8.42%, expectorants and bronchodilators 10.53%, and minerals and enzymes 8.11%.

The handwriting of doctors is also ill-legible in the majority of prescriptions, which causes confusion leading to loss of information in terms of follow-up advice, do's and don'ts, reasons for referrals, dose, and dosing schedule of the drug which should be followed appropriately. There is still a huge scope of improvement in writing prescriptions rationally, after detecting such large number of loopholes within the study.

CONCLUSIONS

Prescription auditing can reflect major errors pertaining to dosing, completeness of the prescription, clearly documented instructions, absence of signature of the authorities, and poor legibility. The prescribing errors further in future lead to adverse effects and unnecessary wastage of resources. This is also a direct indicator of polypharmacy. The foremost duty of the physician is to educate the masses not to take inappropriate and unnecessary medication and for this there should be a proper educational curriculum or workshop mainly which should emphasize general practitioners to prescribe drugs with generic names and from the EDL. Regular training of health-care professionals in this respect will lead to awareness and motivation among prescribers toward rational prescribing. Electronic prescribing techniques and regular prescription review at all times guarantee safe treatment and rational drug use.

AUTHORS' CONTRIBUTIONS

All the authors contributed equally to the paper.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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