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Original Article

Evaluation of prescription errors and prescribing indicators in the private practices in Bahawalpur, Pakistan

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Abstract

Background: Appropriate use of medicines is important to provide quality health. The aim of this study was to assess the prescribing practices and prescription errors in the private clinic practices of Bahawalpur, Pakistan.

Methods: A cross-sectional observational study was performed in March 2015 to assess the prescribing practices and prescription errors in the private clinical practices of Bahawalpur, Pakistan. We used the standard World Health Organization (WHO) methodology to achieve the study objectives. A convenience sampling technique was used to collect the prescriptions from five community pharmacies.

Results: A total of 300 prescriptions were collected. Among the prescribing indicators, the average number of drugs per encounter was 4.5, 23.3% of drugs were prescribed by generic name, 39.6% of encounters resulted in the prescription of antibiotics, in 19% of encounters injections were prescribed and 54.5% of the drugs prescribed were from the Essential Drugs List. A total of 1218 omissions, 510 commissions and 199 drug interaction-related errors were recorded.

Conclusion: Irrational prescribing of medicines and low compliance with the standards of prescription writing were observed in the private clinical practices of Bahawalpur.

Keywords: Community pharmacies; Drug interactions; INRUD; Pharmacist; Prescribing indicators; Prescription errors

1. Introduction

The assessment and evaluation of health care quality is gaining global consideration. Medicines play a pivotal role in the health care delivery system. Appropriate use of medicines is critical to ensure the provision of better medical care to patients.[1] There are certain factors which influence rational prescribing, such as patients, health care professionals, working environment, drugs supply system (including industrial impacts), legal regulations, information and misinformation about medicines and profit intentions in selling more medicines. In general, self-medication, polypharmacy, inappropriate use of antibiotics, overuse of injectable medication and the prescribing of medicines without following clinical practice guidelines are common causes of inappropriate use of medicines.[2]

Prescription errors are significant sources of irrational use of medicines. Invalid prescribing is unsafe and may lead to ineffective treatment, prolongation of disease, distress to the patient and increased costs of medication. Prescription errors may occur due to lack of communication with patients, transcription errors, or ignoring the clinical condition of the patient when writing the prescription.[3] After heart disease and cancer, preventable errors have become the third notable cause of death, resulting in the death of 210,000–440,000 American patients every year in hospitals.[4] Similar statistics are available in the United Kingdom (UK) hospitals, where prescription errors amount to 1.5%.[3]

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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The fundamental step in limiting the irrational use of drugs is to quantify it. In the 1990s, the World Health Organization (WHO), in collaboration with the International Network for Rational Use of Drugs (INRUD), developed a set of indicators to measure the performance of health care facilities related to the utilization of drugs.[1] Similarly, WHO also defined a set of indicators (omission and commission errors) to evaluate prescriptions.[5] In Pakistan, unfortunately, law enforcement agencies have minimal or no checks on the prescriptions written by private sector medical practitioners. Consequently, this leads to the inappropriate use of medicines and the patients are the ultimate sufferers.[6,7]

The aim of this study was to assess the prescribing indicators in the private clinical practices of Bahawalpur, Pakistan. We also report on prescription errors. The results of this study may assist policymakers to in developing and implementing appropriate interventions to promote the rational prescribing of medicines.

2. Methods

2.1. Study setting

This study was carried out at five community pharmacies in the city of Bahawalpur, Punjab province, Pakistan, during March 2015. Bahawalpur is the 12th largest city of Pakistan with an approximate population of 3,333,467 people.[8] There are more than 500 pharmacies/medical stores in Bahawalpur. The selected pharmacies were located adjacent to the Bahawal Victoria Hospital (BVH), which is a major public sector tertiary care hospital in the area. These pharmacies daily receive a large number of prescriptions from public and private sector clinical practices. Most of these pharmacies/medical stores are run without the presence of a qualified pharmacist.

Qualified medical practitioners (physicians, surgeons, gastroenterologists, child specialists, ophthalmologists, chest physicians, dermatologists, psychiatrists and general medical practitioners, etc.) run their private clinics in the vicinity of BVH during the evening hours. A large number of patients with multiple illnesses visit these clinics on a daily basis. Similar to other parts of the country, ischemic heart disease, chronic obstructive pulmonary disease, tuberculosis, cancer, diabetes, hypertension, gastrointestinal diseases, respiratory tract infections, etc., are the most prevalent diseases in the Bahawalpur district.[9] The prescriptions written by the medical doctors are mostly filled by the private pharmacies/medical stores located in front of the hospital.

2.2. Study design

A cross-sectional observational study design was employed.[10,11] Prescriptions written during the study period for the patients attending the private clinics, irrespective of age and gender, were included in the study.

2.3. Outcome measures

2.3.1. Prescribing indicators

The standard prescribing indicators[1] include the average number of drugs per encounter (optimal range 1.6–1.8), the percentage of drugs prescribed by generic name (optimal value 100%), the percentage of encounters with antibiotic(s) prescribed (optimal range 20.0–26.8%), the percentage of encounters with injection(s) prescribed (optimal range 13.4–24.1%) and the percentage of drugs prescribed from the Essential Drugs List (EDL) (optimal value 100%). The optimal values for the prescribing indicators were adopted from a previous study.[12]

2.3.2. Prescription errors

The prescription errors were classified as omission and commission errors and errors related to drug interactions (DIs). Omission errors included those related to patient information (patient's name, age, gender, weight and diagnosis) and errors related to the prescriber's information (prescriber's name, address, phone number, qualification, registration and date). Commission errors included errors related to the dose, dosage form, strength, frequency and duration of the treatment.[5] The errors related to drug interactions were classified as major, moderate and minor and were analyzed using the drug interaction checker provided by www.drugs.com [13] and a book entitled *Drug Interaction Facts* (2015 edition).[14] The drug–drug interactions reported in this study concern potential harm only, i.e. not whether these actually caused any harm to the exposed patients.

2.4. Sample size and data collection method

A total of 300 prescriptions were selected using a convenience sampling technique.[15] Trained data collectors explained the purpose of the study to consenting patients or their attendants presenting prescriptions at the pharmacy counter. The standard WHO/INRUD prescribing indicator form was used to record the data regarding prescribing indicators[1] and a pro forma based on the standard WHO prescription writing parameters[5] was developed and used to record the data regarding prescription errors and drug interactions.

2.5. Statistical analysis

The Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp) was used for the analysis of data. Descriptive statistics were used to present the data.

2.6. Ethical considerations

Ethical approval was obtained from the Pharmacy Research Ethics Committee (PREC) at the Islamia University Bahawalpur (Reference: 101–2015/PREC, dated 4 March 2015).

Note: In this study, the terms "drug" and "medicine" are used interchangeably and are similar in meaning.

3. Results

3.1. Prescribing indicators

The average number of drugs per encounter was 4.5 (SD = 2.0). The percentage of drugs prescribed by generic name was 23.3%. The percentages of encounters with antibiotics and injections were 39.6% and 19% respectively. The drugs prescribed from the EDL amounted to 54.4% (Table 1).

3.2. Prescription errors

3.2.1. Omission errors

In all, 1218 omission errors were recorded in 300 prescriptions. Of these, the errors related to patient's information numbered 785. The most common errors in prescriptions were lack of recording of the patient's weight (n = 239, 79.7%), gender (n = 216, 72%) and age (n = 198, 66%). There were 433 errors related to the prescriber's information, including the absence of the prescriber's registration number (n = 285, 95%) as the most frequent error (Table 2).

3.2.2. Commission errors

There were 510 commission errors in 300 prescriptions. Of these, errors related to the duration of therapy (n = 139, 46.3%) and strength of dosage form (n = 63, 21%) were the most common (Table 3).

3.2.3. Errors related to drug–drug interactions

A total of 199 DI related errors were recorded in 300 prescriptions. Errors related to major, moderate and minor DIs were observed in 41 (13.7%), 108 (36%) and 50 (16.7%) prescriptions, respectively (Table 4).

4. Discussion

Irrational prescribing practices exist all over the world and eventually lead to unwanted effects in patients.[16] In this study, prescription errors and drug use practices of the health care providers were assessed using established norms as standards. As only a limited number of studies are available from Pakistan, our findings could serve as baseline information for policymakers for continuous monitoring of drug therapy and process improvements. Furthermore, our findings may also draw the attention of health care providers from other countries with similar drug use practices.

The results of the study revealed an average number of drugs per prescription of 4.5 (SD = 1.94) (Table 1). This value is higher than the admissible range of 1.6–1.8 drugs per encounter. In contrast to our findings, this value was lower in Malawi (1.8)[17] and Zimbabwe (1.3).[18] However, studies conducted in India (5.6)[19] and Nigeria (5.2)[20] reported relatively higher numbers of drugs per prescription. A higher number of drugs in a prescription could be due to multiple reasons, including incompetent physicians, absence of evidence-based guidelines, incentives for the prescribers, lack of continuous medical education of the prescribers and the shortage of therapeutically correct drugs. Often polypharmacy can adversely influence the treatment outcomes because patients are more likely to be non-compliant and are at a higher risk of adverse events. Moreover, unnecessarily prescribed medicines may negatively influence health care budgets.

Table 1
The standard prescribing indicators (N = 300).

Indicator	Total	Value (SD)	Optimal Level
The average number of drugs per encounter	1345	4.5 (2.0)	1.6–1.8
% drugs prescribed by generic name	313	23.3%	100%
% encounters with an antibiotic	119	39.6%	20.0–26.8%
% encounters with an injection	57	19%	13.4–24.1%
% drugs from essential drugs list[a]	732	54.4%	100%

[a] National Essential Drugs List of Pakistan.

Table 2
Omission errors (N = 300).

Type of error	No. of prescriptions containing errors (E)	Percentage (E/N)100
(a) Errors related to patient's information		
Patient's name not mentioned	20	6.7
Age not mentioned	198	66
Weight not mentioned	239	79.7
Gender not mentioned	216	72
Diagnosis not mentioned	112	37.3
Total	*785*	-
(b) Errors related to prescriber's information		
Prescriber's name not mentioned	33	11
Address/phone number not mentioned	47	15.7
Qualification not mentioned	35	11.7
Registration number not mentioned	285	95
Date not mentioned	33	11
Total	*433*	-
Total omission errors	**1218**	-

Table 3
Commission errors (N = 300).

Type of error	No. of prescriptions containing errors (E)	Percentage (E/N)100
Dosage form not mentioned	28	9.3
Strength not mentioned	63	21
Dose not mentioned	28	9.3
Duration of therapy not mentioned	139	46.3
Frequency not mentioned	22	7.3
Total commission errors	**510**	-

Table 4
Errors related to drug–drug interactions (N = 300).

Types of interactions	No of prescriptions containing errors (E)	Percentage (E/N)100
Major	41	13.7
Moderate	108	36
Minor	50	16.7
Total drug interaction errors	**199**	-

In general, there are strong recommendations to prescribe medicines with the generic names. WHO considers that prescription under generic names acts as a safety measure as it not only guarantees accessible information but also promotes effective communication among health care providers.[16] The results of this study show prescription under generic names of only 23.3% (optimal value 100%) (Table 1). Alarming figures have also been found in a number of other countries such as Andorra (6%)[21] and Lebanon (2.9%).[22] In a few countries, generic prescribing has been found to be near the optimal level, as reported in Timor-Leste (92%)[23] and Ethiopia (98.7%).[12]

Our results reveal a percentage of prescriptions with antibiotics of 39.6% (optimal range 20.0–26.8%) (Table 1). This value was relatively lower in the majority of developing countries, for example Bangladesh (25%)[24] and Brazil (28.8%).[25] In a few countries, antibiotic prescribing is higher, as reported in Kenya (73.4%),[25] Timor-Leste (70%),[23] and Sudan (70.4%).[25] Unnecessary prescribing of antibiotics is associated with antibiotic resistance, adverse drug reactions (ADRs) and frequent hospitalizations.[16] In our study, prescriptions with injections amounted to 19%, within the optimal range (13.4–24.1%) (Table 1). This is a good sign; however, studies conducted in Nepal (5.2%)[26] and Angola (4.6%)[25] reported even lower values. Injections are always more expensive than oral formulations and their excessive use may lead to a higher probability of blood-borne diseases.[2] The use of injections should be limited to emergency cases only.

With regard to the drugs prescribed from the EDL, our value (54.4%) is lower than those reported in the Lao People's Democratic Republic (86.2%)[25] and Bangladesh (85%).[24] Rational prescribing means prescribing drugs from the EDL because medicines in the EDL are older, time tested and mostly available at a lower cost than branded drugs.[16]

A prescription is the reflection of prescribers' attitude towards the disease being treated and the type of health care system in the community.[5] Out of the total 300 prescriptions, none was found to have all the standard prescription attributes and parameters. It is mandatory to provide comprehensive information about a patient on prescriptions for proper dispensing of medicines by a pharmacist. The patient name is a very important parameter in writing a prescription as it identifies the person for whom the medication is prescribed. Similarly, the weight and age of a patient are the most significant parameters for the calculation of accurate doses. If patients' age and weight are not mentioned, pharmacists may not be able to review the prescriptions and correct the treatment regimen. Furthermore, gender is also an important parameter in prescription writing because there are certain medicines that are very effective and beneficial for one gender while contraindicated in the other. WHO states that the diagnosis should be an integral part of the notation in prescriptions[5] as this helps the pharmacist to interpret the prescription and identify and correlate the accurate drugs if the physician's handwriting is illegible. The results of this study reveal that in approximately 80% of prescriptions, the patient's weight was not mentioned. Similarly, the patient's gender and age were missing in more than 65% of prescriptions. A study from Saudi Arabia revealed that patients' names, age, gender and diagnosis were missing in 14.5%, 10%, 4.1% and 6.8% of prescriptions, respectively. Another study from India reported that the age of the patients was absent in 11% of prescriptions, gender in 10% and weight in 100%.[27]

The information of the prescriber is also an important part of a prescription as it helps a pharmacist or any other health care professional contact the prescriber for clarification or discussion of the prescribed medicines. WHO recommends that every prescription should contain complete information on the prescribers,[5] such as their names, addresses, telephone numbers, qualifications and registration numbers. However, the results of this study reveal that none of the prescriptions included complete information of the prescriber. The most alarming finding was absence of registration number of the prescribers in 95% of the prescriptions. A study from Saudi Arabia reported that the prescriber's name was absent in 16.7% of prescriptions, date in 64.3%, address in 90.4% and telephone number in 100%.[28] An Indian study reported that the prescriber's address was absent in 78.2% of the prescriptions studied, telephone number in 89.6%, qualification in 50.5% and registration number in 73.9%.[27] The qualification and registration number of a prescriber are important; if missing, this may raise questions regarding the authority of a person to prescribe medicines.

Complete information concerning the medicines being prescribed is crucial in promoting rational use of medicines and minimizing prescription errors. Incomplete information on prescribed medicines may lead to under- or over-dosing. Similarly, incomplete treatment may increase morbidity, while unnecessarily extended treatment may cause harmful effects and subsequently be catastrophic for the patients and their families. The results of this study demonstrate commission errors in almost all prescriptions. The most important was absence of the duration of therapy in nearly 50% of the prescriptions. A study from Bahrain reported that the duration of treatment was missing in 18.5% of total prescriptions and frequency in 3.7%.[29] A study from Saudi Arabia reported that the frequency and number of doses were not mentioned in 6.9% and 7.6% of total prescriptions, respectively. A study from India showed that the strength of prescribed drugs was absent in 26.8% of total prescriptions, number of doses in 35.1% and duration of treatment in 26.2%.[27]

Despite their pivotal role in the health care delivery system, medicines can also act as a significant source of harm to patients, either by potentially preventable medication errors or non-preventable adverse drug effects (ADEs). Numerous studies have reported the impact of ADEs on the hospitalization of patients.[30,31] It has been noted that the risk of ADRs (including interactions) is related to polypharmacy (concomitant use of $\geq$ 5 drugs).[32] The results of this study regarding the average number of drugs per patient encounter (4.5) is close to 5 and thus there are increased chances of potential DIs and ADEs. Nearly 14% of the prescriptions included major potential drug–drug interactions. Medication errors related to DIs should be avoided to limit ADEs because these are

responsible for 3−23% of total hospital admissions, causing increased morbidity and mortality, making it an expensive and public health defying threat.[33]

This study has its limitations. First, we did not include prescriptions originating from public sector hospitals (for example BVH). However, based on the fact that public sector hospitals mostly provide medicines free of cost and the patients have only to buy out-of-stock medicines from outside pharmacies, it was not possible to evaluate public-sector-based prescriptions. Future studies may evaluate hospital records to achieve similar study objectives. Another limitation of this study is the relatively small sample size. This was due to the fact that either pharmacy managers/owners did not assent to data collection or patients were not willing to share their prescriptions with the data collectors for a range of reasons.

The study shows irrational prescribing practices in the study setting. The resulting values for the prescribing indicators diverge from the established norms. However, the percentage of encounters prescribing an injection was within optimal range. The majority of the prescriptions did not follow the standard prescription writing protocols. Some prescriptions included major drug−drug interactions, which is alarming.

Based on these findings, it is recommended that there should be continuous education and training of physicians regarding the rational prescribing of drugs. The presence of pharmacists should be ensured at all pharmacies for the proper dispensing of medicines and patient counseling. Appropriate error reduction strategies, such as an error reporting system and computerized prescription system, may be implemented to avoid preventable medication errors. For continuous improvement, monitoring of the prescribers' prescription trends is also recommended. Further studies are encouraged to highlight the reasons for the irrational use of drugs.

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