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Assessment of errors and incompleteness of prescriptions in outpatient clinics of public sector hospital in Karachi, Pakistan

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ABSTRACT

Prescribing errors are considered as one of the important source of medication errors which can lead to adverse drug reactions. It can be preventable by limiting the errors in the medications prescribed. In the present study, physician prescriptions of outpatient clinics were evaluated for the completeness of information needed in prescriptions. Around two thousand seven hundred prescriptions were evaluated. An average of five drugs per prescription was prescribed. Medical record number, patient's height and allergy status of patient was not declared in any of the prescription. Patient's name (96%), physician contact number (63%), dosage form (83%), strength of drug (71%) and duration of therapy (78%) were mentioned in comparatively good number. A very low number of drugs (10%) were prescribed by generic name. Major drug-drug interactions were found in 18% prescriptions. Omission of essential information from the prescriptions will definitely be the source of medication errors that can be prevented by utilizing services of pharmacists in community pharmacies.

Key words: Prescription Errors, Drug-Drug Interactions, Community Pharmacy

INTRODUCTION

A prescription is an instruction from a prescriber to a dispenser. According to World Health Organization (W.H.O), a prescription can be defined as a set of prescriber instructions to the dispenser [1]. The Drug Act of Pakistan defined prescription as written instructions by practitioners stating amount of drug needed for the person named therein [2]. The prescriber can be independent prescriber such as doctors, dentists or pharmacist independent prescriber who can prescribe any medicine for any medical condition within their competence. The dispenser is not always a pharmacist but Nurses, midwives, physiotherapists and pharmacists referred to as supplementary prescribers who are responsible for continuing patient care after the assessment of independent prescriber [3]. Prescription of the medicine is the output of medical consultations [4,5]. Quality of the prescription is very significant for

accurate dispensing of prescription and reduces the chances of medication error. Physician should follow the rules of writing prescription for the benefit of patient. Irrational and incomplete prescription is still very common worldwide [4-8]. Irrational and inappropriate use of drug may lead to Adverse drug reactions (ADR) and Drug-Drug interaction, unsafe treatment, elongation of sickness or hospital stays and increment of healthcare costs [4-6,8-10]. So, it is very important to assess the physicians prescribing behavior [11].

There is no global standard regarding the minimum requirements of prescription writing but some important parameters should be present such as name and address of prescriber (if possible along with contact number), date of prescription, patient information, name and strength of drug, dosage form and amount to be dispensed and information for the package label. Except prescriptions of controlled medication or narcotic drugs, the drug act of Pakistan does not include any such legal obligation for healthcare practitioners to follow any minimum standards for prescriptions which has a great potential to cause a medication errors.

Prescribing errors can be a source of economic burden on the patients. Preventing prescribing error can results in higher benefits than the costs related to the net time investment [12]. Van den Bemt et al. (2002) studied the prescribing errors identified by hospital pharmacy staff in two Dutch hospitals. Around 9.9% (351) of the prescribing errors were identified out of total 3540 orders in five days of study. The highest number of prescribing errors (n=155) were reported due to lack of instructions regarding use of medications. Around 155 errors were reported due to unclear or wrong name of medication while duplication of medication in same prescription counts around 3.3% of the total errors reported [13]. Velo et al. (2009) reported that around 70% of the ADR were due to different errors in prescription [14]. Prescribing errors occurring in about 4 out of 1000 prescriptions have the potential of causing ADR [15]. Prescribing error can lead to ADR which were associated with increase in patient hospital stay at an average of 2.2 days [12]. Bates et al. (2010) reported a frequency of prescription errors in Irish hospital which stated that 83% prescriptions were without any allergy status, patient weight was not mentioned in 91% prescriptions, medication start date was absent in 8% while route of administration was not present in 13% prescriptions [16].

Cunney et al. (2003) analyzed 1488 hospital prescriptions and reported that 5% prescriptions seemed to be illegible because of the incompleteness of vital information needs to be present in prescription and trend of prescribing medicines by means of generic names found to be very low [17]. Rosa et al. (2009) examined 4206 prescriptions which showed error in 47% of prescriptions related to the name of patient while 33.7% prescriptions were difficult to identify as the information related to prescriber was not present [18]. Cyntheia siders reported 36.3% prescribing errors of total 896 errors reported in clinical setup, in which 141 errors were reported of wrong dose [19].

Mohammad et al. (2015) studied 600 prescriptions collected from different community pharmacies of Punjab and reported that the essential elements of a prescription such as subscription and superscription were not completed in 14.6% and 30.6% prescriptions [20]. Nesar et al. (2014) identified 1627 medication errors in total 450 prescriptions of different outpatient settings with most frequent error of not mentioning patient's weight in 95% of patients [21]. Baig et al. (2012) conducted a cross sectional study on 400 prescriptions collected from hospital and community pharmacies of Karachi, Pakistan. Dose related errors were found in about 5.5% prescriptions while 27% of prescription's doses were not evaluated due to certain factors like writing, non-availability of patient weight and age information [22]. Tahir et al. (2012) also stated 5% dose related errors in a study of 100 prescriptions collected from different community and hospital pharmacies of Lahore [23]. Riaz et al. (2014) conducted a study on around 2000 prescriptions collected from inpatient pharmacies of two hospitals from Lahore and reported around 19% prescriptions with overdose of any one of medications while 7.9% prescriptions with under dose of one drug in studied prescriptions [24]. Saleem et al. (2007) reported that 90% prescriptions collected from public sector tertiary care hospital setting of Hyderabad did not contain basic information of prescription such as Patient's weight, prescriber's contact and duration of therapy [25]. Siddiqui et al. (2015) studied 100 prescriptions collected from public and private sector hospitals of Karachi and reported that patient's allergic status was not mentioned in 96% prescriptions and not a single medication was prescribed by generic name [26]. Ghoto et al. (2013) studied 286 prescriptions with antibiotic and revealed 29.37% prescriptions have dose frequency related errors while 28.67 prescriptions had incorrect administration information of drugs [27].

From the above literature survey, it is evident that maximum number of prescriptions utilized in local

studies ranged from 100 to 2000. However the data generated using limited prescriptions might not be true representative of population index. The objective of present work is to collect prescriptions from community pharmacies situated in hospital setting and to check the completeness of information.

METHODOLOGY

This prescription evaluation prospective cohort study was conducted in some community pharmacies situated adjacent to tertiary care Government Hospital, in Karachi. A group of four Pharmacists practicing as Hospital Pharmacists in private hospitals in the evening shift devoted their time to conduct this study in the months of January- March, 2016.

The prescriptions were evaluated for the extensive information required i.e date of prescription, diagnosis, previous history of illness, physician's contact number, follow up date, complete patient information including age, weight and height. All these information were tried to verify during a brief interaction for the purpose of counseling of medications with the patient or the person coming with the prescription on the counter. The dosage form, name and strength of the drug were analyzed from Dataset of PHARMAGUIDE (24^{th} edition, 2016), Pakistan [28].

The dose of the drugs and duration of therapy was analyzed by online drug information database of MICROMEDEX [29]. The drug-drug interactions were evaluated by the MICROMEDEX which categorize drug-drug interactions into four severities:

(i) Contraindicated: the drugs are contraindicated for concurrent use
(ii) Major: the drug interaction may be life threatening and/or require medical intervention to minimize or prevent serious adverse effects
(iii) Moderate: the interaction may result in exacerbation of patient's condition and/or require an intervention in result
(iv) Minor: the interaction would have limited clinical effects.

Manifestation may include an increase in frequency or severity of side effects but generally would not require a major alteration in therapy [29].

The documentation of these drug-drug interactions were categorize into three forms

(i) Excellent: controlled studies have clearly established the existence of interaction.
(ii) Good: documentation clearly suggests that drug interaction exists but controlled studies are lacking.
(iii) Fair: available documentation is poor but pharmacologic considerations lead clinicians to suspect drug interaction [29].

The pattern of the medicines prescribed was also checked that whether the medicines were prescribed as a generic name or brand name. The medicines prescribed as a brand name were checked from PHARMAGUIDE that either the brand prescribed was of multinational brand pharmaceutical company or local pharmaceutical company [28].

A snap shot of all the prescriptions which were counseled by the pharmacists was taken and saved for evaluation purpose.

DATA COLLECTION

The prescriptions evaluated for the study were of those patients who visited these community pharmacies between the timings of 9am to 3pm on four working days from Monday to Thursday during the study period. The reason of choosing these community pharmacies is to have a better analysis and understanding of outpatient prescriptions of hospital. The study involves only those prescriptions which were obtained from the outpatient clinics of the hospital and counseled by the pharmacists irrespective of the patient age or diagnosis.

Statistical Analysis

All the data collected is analyzed by Microsoft Excel 2010.

RESULTS

A total of 2785 prescriptions were evaluated during the study period of 52 days in three months with an average of 54(53.6) prescriptions per day. This means that the pharmacist accommodate around 9(8.92) prescriptions per hour. The highest number of prescriptions was found to be on Mondays with an average of 65(n=845) prescriptions with the lowest on Thursdays with an average of 44(n=614) while the average number of prescriptions on Tuesdays and Wednesdays were 47(n=616) and 54(n=710) respectively. The maximum count of prescriptions on one day was 86 with the minimum count of 38 prescriptions. Approximately, 66% of the patients came to the pharmacy on their own to purchase their medicines otherwise one of the family attendant came with the prescription. A total of 42% (n=1170) prescription were of male patients out of which 27%(n=316) prescriptions were of patients aged 12 years or less while 14%(n=226) of the total 58%(n=1615) female patients prescriptions were of patients below 12 years.

Date of Prescription
Date of the prescription was mentioned in 95.5%(n=2661) in which date was mentioned at the top of prescription in 81.4% prescriptions.

Medical Record Number
Medical record number was not mentioned in any of the prescription.

Physician's Name
Physician's name was mentioned on 75.18%(n=2094) prescriptions. The qualification of Physician along with the name was mentioned on 82.3%(1723) prescriptions.

Physician's Contact Number
Physician's contact number was present in 62.7%(n=1746) prescriptions of which contact number was written by hand on the request of patient in 13.9%(n=243) prescriptions.

Patient's Name
Patient's first name was written in 95.6%(n=2663) and 4.4%(n=122) prescriptions did not contain patient's first name. Out of 2663 prescriptions containing first name, 48.2%(n=1284) prescriptions comprise first name and last name both while 51.8%(n=1379) prescriptions did not have patient's last name.

Patient's Gender
A total of 19%(n=530) prescriptions had patient's gender written on it while 81%(n=2255) prescriptions had no information on patient's gender.

Patient's Age
Patient's Age was mentioned in 31%(n=864) prescriptions and 69%(n=1921) had no patient's age. Out of 864 prescriptions with patient's age, around 62.7%(n=542) of total prescriptions were of patients with an age of 12 or less. During medication counseling of patient, age of the patient was written manually by the pharmacist on the prescription which showed that a total of 28.3%(n=790) prescriptions were of patients aged 12 year or less, 26% patients aged between 12-50years and 46%(n=1270) prescriptions were of patients aged 50 or above.

Patient's Weight
Patient's weight was mentioned in 13%(n=267) prescriptions in which 97%(n=259) prescriptions were of patients aged 12year or less.

Patient's Height
Patient's height was not mentioned in any of the prescription.

Illness History of Patient
The previous history of illness was present in 15.2%(n=423) prescriptions in which 41.3%(n=175) prescriptions were of patients aged 50 or more.

Diagnosis
Diagnosis was mentioned in 79%(n=2210) prescriptions while 21%(n=575) prescription were without any diagnosis or previous history.

Drugs per Prescription
A total of 14482 medications were prescribed in 2785 prescriptions at an average of 5 drugs per prescription. For patients aged 12 years or less, the average drugs per prescription falls to 4 drugs per prescriptions (2061 drugs in 542 prescriptions). The average drugs per prescription was 6 (8003 drugs in 1270 prescriptions) for people aged 50 year or old while 5 (4418 drugs in 903 prescriptions) for people aged between 13-50 years.

Prescribed by Brand Name/Generic
Out of 14482 medications of 2785 prescriptions, only 10%(n=1491) drugs were prescribed by generic name otherwise all the other drugs were prescribed by brand name. A total of 9%(n=239) prescriptions out of 2785 contain one drug which was prescribed by generic name and 2 %(n=48) prescriptions contain a maximum of two drugs which were prescribed by generic name. Around 2498 prescriptions were prescribed entirely by brand names.

Dosage Forms
Dosage forms of the drugs prescribed was mentioned with 83%(n=11976) medicines out of which 13% dosage forms was wrongly mentioned when equated with PHARMAGUIDE. Around 3% prescriptions were without any dosage form mentioned with any of the drug prescribed. The drugs in which no dosage form was mentioned in the prescription were completed by using PHARMAGUIDE, Pakistan [31]. The tablet and capsule dosage form comprises 67%(n=9703) of the drugs prescribed in which tablet alone constitutes 58% of the total drugs prescribed. Oral solution such as syrups, elixirs and suspensions involves 17% of the drugs prescribed. Injectable drugs were prescribed less frequently and consist of 4% medications whereas topical dosage forms made up around 9% drugs. Nebulization medications were constitutes 2% drugs of the total drugs prescribed. Other dosage forms such as inhalers, powders and medicated shampoo/soaps consist of 1%, 0.3% and 0.08% drugs respectively.

Strength of Drugs
Strength of the drugs was mentioned with

71%(n=10254) drugs of the total drug prescribed in which 23%(n=2317) drugs have wrong drug strength. The drugs which were prescribed without strength mostly include oral solutions and topical dosage forms of which more than 80% drugs were prescribed without any strength. The tablet and capsule dosage form comprises 67%(n=9703) of the total drugs prescribed, of which 72%(n=7024) drugs prescribed had drug strength mentioned with them.

Duration of therapy

Duration of therapy was mentioned with 77%(n=11205) drugs and no duration of use was written with 23% drugs. Out of 11205 drugs with duration, the duration was individually mentioned with drug in 58%(n=6746) drugs while with other 42%(n=4459) drugs, the duration of therapy was mentioned as a whole in the end of prescription.

Drug Interactions

No drug-drug interaction was found in 42%(n=1170) prescriptions while 58%(n=1615) prescriptions had one or more drug-drug interactions. Out of total prescriptions with drug interactions, minor drug-drug interaction was found in 24%(n=388) prescriptions in which single minor drug-drug interaction appeared in 45%(n=175) prescription. Moderate drug-drug interactions had been found in 33%(n=533) of total drug interaction prescriptions in which single moderate drug-drug interaction was found in 38%(203).

Major drug-drug interaction was reported in 32%(n=517) of total drug interaction prescriptions in which 44%(n=227) prescriptions had single moderate drug-drug interaction while a combination of major-moderate and major-minor drug interactions were found in 21%(n=109) and 27%(n=140) prescriptions with drug-drug interactions respectively.

Contraindicated drug-drug interaction was reported in 11%(n=177) prescriptions out of which single contraindicated drug-drug interaction was found in 27%(n=48) prescriptions of total drug-drug interaction prescriptions while a combination of contraindicated-major drug-drug interactions were found in 22%(n=39) prescriptions. The documentation of all these drug-drug interactions has been summarized in the Table no. 1.

DISCUSSION

Medication errors caused due to mistakes in prescription or prescribing are one of the leading sources of adverse drug reactions which can result in serious complications such as life threatening illness, permanent disability or even death. One-third of these adverse drug reactions are avoidable by reducing the preventable errors. The findings of present study showed that most of the prescriptions lack important patient and medication related information which can lead to important clinical manifestations.

No patient prescription has the medical record number mentioned on it. The reason might be that the physicians usually keep all records in patient medication file that can be retrieve during the follow up visits. Date of prescription and prescriber's name was mentioned on most of the prescriptions. This information enables pharmacist to decide refills and duration of therapy. Patient's age was missing in around one in every four prescription. This can be misleading, particularly for children dosage regimen and elderly with poor body functions.

Presently, the average number of drug were found to be 5 drugs per prescription which was similar as reported by Cunney et al. (2003) and Nesar et al. (2014) but higher when compared to 3 and 1.4 drugs per prescription as reported by Raza et al. (2014) and Guyon et al. (1994) [17,21,30,31]. The prescribing tendency by name of generic drugs found to be very low and this trend can have an economic impact on the patients as most of the drugs prescribed by brand name. Prescribing by means of generic name can be cost effective for patients [32, 33]. Only 1 of every 10 drugs prescribed was found to be recommended by generic name. our study reported only 9% prescriptions while Saleem et al. (2007) reported around 15% prescriptions which include atleast one drug prescribed by generic name [25].

Date of prescription was not mentioned in 5% of prescriptions. Some similar results were reported by Mohammad et al. (2015) and Tahir et al. (2012) who reported 7% and 12% prescriptions respectively [20, 23]. The prescriptions without patient age were around 69%, in comparison to Nesar et al. (2014), Mohammad et al. (2015) and Gotho et al. (2016) who reported 52%, 70% and 25.2% prescriptions respectively[21,20,26]. In comparison to 3% prescriptions reported by Mohammad et al. (2015) without patient's gender mentioned, our study also revealed very contrasting results of 81% prescriptions [20].

Patient's weight was not stated in 87% patients which can be source of important medication error of overdosing as most of the patients specially those aging below 12 years needs to be calculated based on patient's body weight. Similar results were reported by Nesar et al. (2014), Saleem et al. (2007) and

Gotho et al. (2016) with 95.1%, 95.5% and 89.9% prescriptions respectively. The patient's height and weight is also important for calculating renal creatinine clearance for renal dose adjustment for patients on dialysis or impaired renal function [21,25,26].

Diagnosis of the current illness was mentioned in 4 out of every 5 prescriptions while the history of the previous illness was not written in most of the prescriptions. The diagnosis of patients was not mentioned in 21% prescriptions which is found to be satisfactory when compared to the 34% and 79% reported by Nesar et al. (2014) and Siddiqui et al. (2015) [21,26]. Patient related basic information such as name, age and weight was completely written in 1 out of every 10 prescriptions whereas disease related information of patient was fully present in 12 out of every 100 prescriptions. Patient allergy status was not specified on any of the prescriptions evaluated.

Duration of therapy was intimated in 78% prescriptions against a low number of just 65% and 6% prescriptions reported by Shumaila et al. (2016) and Saleem et al. (2007) [23,25]. Allergy status was not specified in any of the prescription which is very inadequate even when compare it to Tahir et al. (2012) who reported 18% prescriptions [23]. Dosage form and strength of medications prescribed were reported to a satisfactory level. Dosage form was not mentioned in 18% medications prescribed which is quite high when compared with 9% as proclaimed by Raza et al. (2014) [31]. Strength of the drug was mentioned in 71% medications in contrast to 95% reported by Nesar et al. (2014) [21]. Possible moderate drug-drug interactions were reported in 18.2% prescriptions against 32% prescriptions reported by Ghoto et al. (2013) [27].

Our findings reflect prevalence of 58% prescriptions with drug-drug interactions (although not all are major or contraindicated). A previous study has reported a prevalence of 74% prescriptions with drug-drug interactions [34]. This finding might reflect the same data pattern as reported earlier. However, it might be less visible in earlier studies due to limited number of prescriptions [35,36]. contraindicated drug interactions are reported in 11% prescriptions which is almost similar to 13% reported by Ismail et al. (2016) [34]. Major drug interactions was reported in 18% of total prescriptions studied which is less when compared to 23% and 21.4% reported previously in studies conducted in Pakistan [34,35].

CONCLUSION

Evidence of the facts reported in the study revealed that the omission of important drug related and patient related information required for prescription may become source of serious adverse drugs reactions. The shortage of time may also be the factor of incomplete information in the prescription because large number of patients visits in the clinics timing. A single pharmacist was not available in 15 pharmacies near by the hospital of which prescriptions were evaluated. It is the need of time to make sure the presence of pharmacist in all the community and hospital pharmacies. Pharmacist will reduce the errors associated with absence of essential information from prescriptions. The physician's education also need to be improvised so that the errors frequency can be minimized and later counter checked by at the pharmacist end.

TABLE 1- Summarized bifurcation of Drug-Drug Interactions

DRUG-DRUG INTERACTIONS				
Documentation Type	**Contraindicated (n=177)**	**Major (n=517)**	**Moderate (n=533)**	**Minor (n=388)**
Excellent	112	194	164	162
Good	37	187	224	136
Fair	28	136	145	90

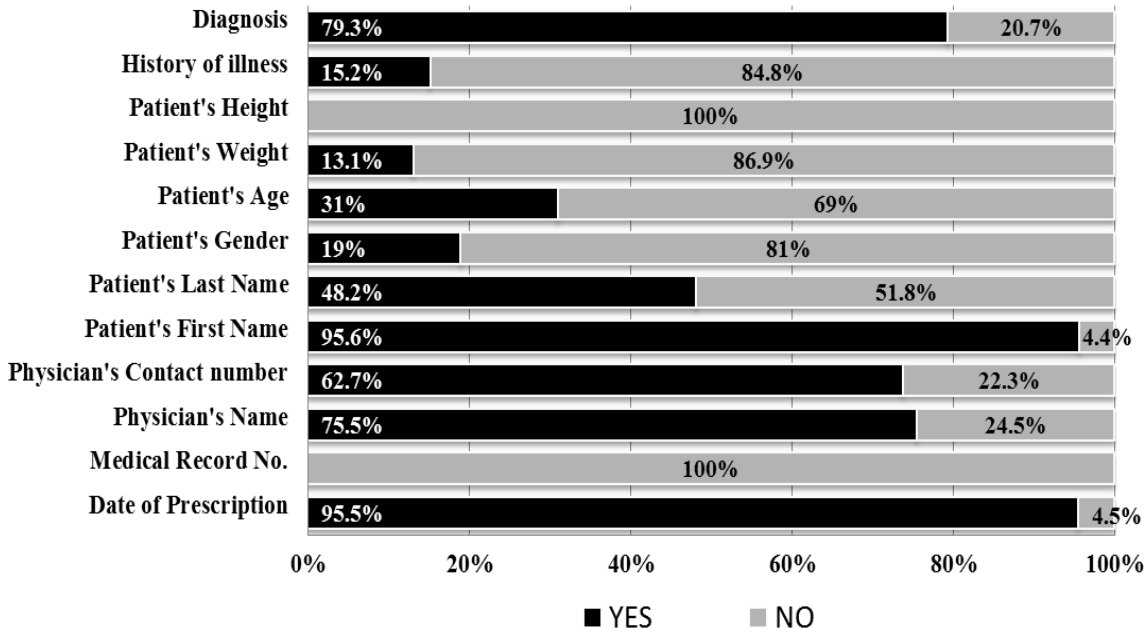

Figure 1- Summarized chart of different components of prescriptions; X-axis represents the percentage; Y-axis represents component of prescriptions. **YES** (in black colour) represents the percentage of component present in prescriptions; **NO** (in grey colour) represents the percentage of component not mentioned in the prescriptions.

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