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Handwritten medical Prescription Errors in hospital out-patients: Incidence and Types

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Abstract:

Background: In Yemen, the written prescription in the daily medical practice is associated with increasing of the prescribing errors, which can lead to various detrimental consequences for patient and community. This was the main problem that pushed us to carry out this study.

Objective: to evaluate the incidence and types of the prescribing errors in handwritten medical prescription by licensed prescribers for the outpatients at selected hospitals.

Materials and methods: A hospital-based prospective study, has been designed by the descriptive cross-sectional manner, during a time period from January up to March, 2020. A total of 432 handwritten prescriptions were collected from emergency departments and outpatient clinics at selected public and private hospitals of Dhamar city, Yemen. Data in each handwritten prescription were extracted and filled into the corresponding data form and independently reviewed. Data were presented in frequency and percentage using descriptive statistics.

Results: Out of 432 handwritten prescriptions, 3 (0.7%) prescriptions were considered to be of good quality, while 429 (99.3%) prescriptions contained 3788 prescribing errors, with 8.8 errors per handwritten prescription. Illegible handwriting was the serious problem that was encountered in 58.5% of the prescriptions. The majority of prescribing errors were medication information –related errors (52.2%), where route of administration and strength of prescribed medication lacked in 82.8% and 66.0% of the handwritten prescriptions, respectively. Name, gender, age and diagnosis of disease of patient did not write in 7.2%, 77.2%, 69.5% and 49.2% of the handwritten prescriptions, respectively. As well as, failure to print name, qualification, and signature of the prescriber in 34.0%, 41.5%, and 20.3% of the handwritten prescriptions, respectively.

Conclusion: Errors in writing a prescription is a high problem at the study area. This calls for developing of consistent educational interventions. In addition, electronic prescription system should

be introduced, and pharmacists should be involved in all levels of the handwritten prescription writing process. These, will improve skills of prescribers and avoid the negative consequences of errors on patient and community.

Key words: Medication, Errors, Handwritten Prescription, Writing, prescriber, patient.

Introduction

A prescription is a written document that engages the medical and legal responsibility not only of the physician but of all those subsequently involved in its execution It is a medico-legal document that is written completely, precisely, and legally [1-5].

Prescription writing is an art, which provides information regarding medication use to the patient, and it is the responsibility of the prescriber [3, 6]. Hence, any prescriber should make an accurate diagnosis, and should be compliant with guidelines of prescription writing in order to provide effective and safe therapy for patients [7-10].

The good writing of the medical prescription has a great influence on the fate of drug therapy, health of patients and it is also a very important element in reducing of errors during the dispensing of medications by the pharmacist [3-7]**.** According to the World Health Organization (WHO), any handwritten prescription should be legal document, and should be written clear and correct manner [8]. Each handwritten prescription should contain appropriate prescriber, patient and prescribed medications- related information, without unauthorized abbreviations. [2- 11].

A prescription error is a failure in the prescription writing process that results in a wrong instruction about one or more features of a handwritten prescription. Therefore, errors of prescribing can arise at any part of the prescription process from the moment the prescriber makes the choice of drug treatment to the time the patient receives that treatment [2-4,10-15].

Prescription errors have been classified as error of omission and error of commission, which require reactive and proactive interventions by pharmacist to rectify them. The error of omission means the handwritten prescription is incompletely filled, like missing of patient's information, incomplete direction regarding dosage, dosage form, and illegible prescriptions. The error of commission includes wrong information regarding the medication or patient like wrong drug name, route of drug administration, dosage form or strength. Commission error may also include incorrect patient's name, which it may cause dispensing the medication to the wrong patient [2-6,13,16].

Prescribing errors may have various detrimental consequences, where, medication prescribing deficiencies are the commonly cause of actual and potential adverse drug events. Incorrect prescribing, inadequate information by the prescriber or the pharmacist and incorrect use of medications by the patient can cause suffering to patient, drug- related hospital admission and increasing cost of therapy for patient and community.[2-5, 13-23].

It is estimated that the prevalence of errors in writing of prescriptions in clinical practice in different parts of the world is high. It has been reported that errors in writing of prescriptions are attributed for 70% of all medication errors. [2,3, 24]. A study that was conducted at the university hospital in Shiraz, Iran, revealed that 96.5% of handwritten prescriptions contained prescribing errors. [19]. Furthermore, two studies that were

carried out in Tanzania, showed that 85.1% and 99.6% of all handwritten prescriptions had at least more than one error per prescription.[2, 6]. A retrospective cross-sectional study that was carried out at Tikur Anbessa Hospital in Ethiopia, showed that only 42.89% of the handwritten prescriptions contained omission errors.[21].

The identifying and prevention of errors at the prescribing stage are of the important steps towards reducing medication errors. There are different interventions that have been adopted to minimise or prevent these errors. In developed countries, a system of electronic prescription has been adopted and studies have shown that the errors in writing of prescription are significantly reduced from 13% to 99%. [4, 16 - 21].

In the majority of developing countries the handwritten prescriptions being handwritten, which can lead to the possibility for committing of errors during the process of writing of these prescriptions[17-21]. Therefore, the periodic evaluation of handwritten prescriptions can be a good tool to assess the appropriate use of medications in terms of prescribing, dispensing, and to evaluate patient understanding regarding medication use [3,10].

Although the errors in writing a medical prescriptions have been systematically studied at health care sector of many countries worldwide [2-4, 21-27], there is a paucity in the number of published studies on errors of handwritten prescription in Yemen[7,22]. Thus, the current study was designed to evaluate the common prescribing errors in handwritten prescriptions at outpatient clinics of some public and private hospitals in Dhamar city.

Material and Methods:

Study setting:

The current study was carried out at emergency departments and outpatient clinics, included, medicine, surgery, orthopaedics, ear nose and throat (ENT), paediatric, gynaecology and obstetrics, ophthalmology, psychiatry, and dental clinics, at selected public and private hospitals of Dhamar city, Yemen.

Study period:

Data were collected during the period of three months, from January, up to march, 2020

Study design:

A hospital-based prospective study, has been performed by the descriptive cross-sectional manner on random sample of handwritten prescriptions of outpatients, without informing the physicians.

Study population

The study population involved both male and female patients of all age groups, who visited emergency departments and outpatient clinics of selected hospitals.

Sample size:

Irrespective of patients age and gender, a total of 432 handwritten prescriptions were randomly collected from outpatients, who visited emergency departments and outpatient clinics of selected hospitals during the study period.

Inclusion and exclusion criteria

All the handwritten outpatient prescriptions that contained at least one medication were collected for reviewing of the prescribing errors. No more than one handwritten prescription was taken from each outpatient. Outpatients who are visited emergency departments and outpatient clinics of selected hospitals, and not receive

handwritten prescriptions, were excluded. As well as, any electronic prescription was excluded.

Study tool

Data for this study were extracted from handwritten medical prescriptions of outpatients by using a data collection form, which was designed by using standard forms of handwritten medical prescription. The collected data were divided into general prescription –related information (date, legible handwriting, Rx symbol), prescriber's information (name, registration number, date and signature), patient's information (name, age, gender, and diagnosis), and prescribed medication-related information (name, number of medications per prescription, dosage form, strength, dose, frequency, route of administration quantity and duration of therapy)

Prescription's data collection procedures

The handwritten medical prescriptions were manually collected from emergency departments and outpatient clinics of selected hospitals. Data in each handwritten prescription was extracted and filled into the corresponding data form and independently reviewed. The errors related to patient, prescriber and medication information in each prescription were transferred to tables to facilitate the statistical analysis.

Ethical consideration:

This study was approved by Medical Ethics Committee of Faculty of Medical Sciences, Al-Saeeda University**.** A permit to access the handwritten prescriptions of outpatients was obtained from the executive directors of the selected hospitals. A verbal consent was obtained from each participating outpatient before collecting of data. All data of the outpatients will be kept secret.

Data analysis

Data processing, and statistical analysis were conducted using a Statistical Package for Social Sciences software SPSS (version 26.0). Descriptive analysis was conducted, and all the results were expressed as frequencies and percentages.

Results and discussion:

Writing of the handwritten prescription is one of the most important basic skills that a doctor needs. Worldwide, there is increasing in the number of the reports about errors in the handwritten prescriptions at health care sector. Prescribing errors may have various detrimental consequences to both patient and community [3, 17-19]. Hence, the components of the handwritten prescription should be clearly written, free of drug related omission, commission and integration errors, without nonofficial abbreviations, and fulfil the legal requirements of a handwritten prescription [2, 17-22].

The prevalent type of error varies among studies and is affected by many factors, such as, study design and site [23]. Over the recent years we have witnessed an increasing tendency for errors in writing of a medical prescription in clinical practice in Yemen [7, 22].This is supported by the current study, which has demonstrated a wide range of different types of errors associated with writing of a prescription at outpatient clinics of some public and private hospitals at Dhamar city.

1. Types of the prescribing errors

Out of 432 handwritten medical prescriptions, 429 prescriptions contained the prescribing errors, giving an error rate of 99.3% as outlined in Table 1.

Table 1. Types of prescribing errors and the number of errors per prescription

Type of error	No. of errors	% of errors	No. of errors per prescription
General prescription-related	504	13.3	1.2
Prescriber-related	437	11.5	1.0
Patient-related	871	23.0	2.0
Prescribed medication – related	1976	52.2	4.6
Total	3788	100	8.8

This result is somewhat similar to what are reported in two studies conducted in Yemen by Al Worafi et al., 2018 and 2014, which showed that the error rate in the handwritten prescriptions was 99.12%. [7, 22]. However, Mambile et al., 2016, and Sada et al., 2015, reported that the error rate in the handwritten prescriptions was 85.1% and 42.9%, respectively [20, 21].

Furthermore, this result is slightly lower compared to those in two studies conducted in Iran and Malaysia, which respectively revealed that 96.5% and 96.7% of handwritten prescriptions did not follow at least one of the legal or procedural requirements [19, 24]. In Tanzania, two studies, carried out by Audax et al., 2019 and Mugoyela et al., 2008, also showed that the error rate in the handwritten prescriptions was higher than error rate in the current study, which represented, 100% and 99.6%, respectively [2, 6].

Errors related to prescribed medication were the most common (52.2%), follow by errors related to patient (23.0%), and errors related to general prescription (13.3%), while those related to prescriber were 11.5%, as shown in Table 1. Similar findings were reported in a previous study conducted by Al Worafi, 2018, which showed that errors related to patient and prescribed medication were the most common, while those related to the prescriber were the least common [7]. However, Al Worafi, 2014, reported that errors related to prescriber details were the most common [22].

2. Number of errors per prescription

The current study showed that 3788 errors, with an average of 8.8 errors per each handwritten prescription, as seen in Table 1. These findings are incompatible to those in two previous studies conducted in Tanzania and Nepal, which revealed that there was an average of 3.9 and 10.9 errors per handwritten prescription, respectively [2,3]. Al Worafi et al., 2018, reported that the number of errors ranged from 5 to 20 per handwritten prescription [7].

This discrepancy may attribute to differences in the duration of reporting of prescribing errors, sample size, target populations or the level of knowledge about prescribing practice, and the lack of enforcement of regulatory policies regarding prescribing of medications.

3. General prescription's information-related errors

Good quality handwritten prescriptions are very important for minimize errors in the dispensing of medications. Illegible handwriting is a serious problem that might lead to dispensing the wrong medication to the patient, with serious or lethal injuries [7, 25].

Table 2. General prescription's information-related errors (n= 429)

Missing detail	No. of errors	% of errors
Bad handwriting	251	58.5
Date	134	31.2
Rx symbol	119	27.7

In the present study, illegible handwriting was one of the main problems (58.5%) they encountered in the handwritten prescriptions, as seen in Table 2. A high poor handwriting has been reported by Al Worafi,

2018 and Irshaid et al., 2005 [7, 25]. However, illegible handwriting that had been reported by other studies was lower than the present study [3, 26 -28].

Regarding date of the handwritten prescription, 134 (31.2%) of reviewed prescriptions were not dated, as outlined in Table 2. This is not in line with the findings of Al Worafi, 2018, and Irshaid, 2005, who reported date was missing in 74.33% and 64.3% of handwritten prescriptions, respectively [7, 25]. However, Ansari et al., 2009, Raja et al., 2019, Ni et al., 2002, and Balbaid et al., 1998, found that the date did not indicate only in 15.7%, 1.2%, 17.1 and 8.7% of handwritten prescriptions, respectively [3, 17, 24, 26].

Similarly, the Rx symbol did not write in 119 (27.7%) of the handwritten prescriptions, as seen in Table 2. In a study by Ansari, et al., 2009, 67% of handwritten prescriptions also lacked Rx symbol [3].

4. Prescriber's information -related errors

The prescriber -related details must be required on the handwritten medical prescription, which it is the only document that authorizes the pharmacist to dispense the majority of medications classes [23, 25]. Moreover, the absences of prescriber's details make it difficult to communicate by pharmacist in confusion on medication writing and by patient in further follow up on their medical condition. The prescriber's identity and signature must be written legibly and regularly checked before dispensing to avoid the misuse of medications, particularly psychotropic or dangerous drugs [17, 23, 25, 29- 31].

Among 3788 prescribing errors, 437 (11.5%) of errors were related to prescriber's details, with 1.0 error per handwritten prescription, as outlined in Table 1. A study conducted in Tanzania by Audax et al, 2019, reported that among 933 of the prescribing errors, 610 errors were related to prescriber's details, with 3.8 errors per handwritten prescription [2].

Failure to print qualification, name, and signature and registration number in 41.5%, 34.0%, 20.3% and 6.1% of the handwritten prescriptions, respectively, as outlined in Table 3.

Table 3: Prescriber's information - related errors (n=429)

Missing detail	No. of errors	% of errors
Name of prescriber	146	34.0
Qualification	178	41.5
Registration number	26	6.1
Signature.	87	20.3

These findings disagree from those obtained in previous studies. Al Worafi et al., 2018, reported that the rates of missed name and signature of the prescriber found in 1.19% and 2.34% of handwritten prescriptions, respectively [7]. Ansari et al, 2009, revealed that the rates of missed name, qualification, and NMC registration number and signature of the prescriber found in 23.3%, 27.1%, 27.1% and 4.3% of handwritten prescriptions, respectively [3]. Meyer et al, 2000, reported that the failure in print name (96%), illegible signature (94%), and failure in DEA number (89%) in the handwritten prescriptions were the main prescriber's information -related errors [27]. Irshaid et al., 2005, reported that 16.7% of handwritten prescriptions deficient in the prescriber name and 18.1% deficient in the prescriber signature [25]. Balbaid et al., 1998, reported that 14% and 16.3% of the handwritten prescriptions were deficient in the prescriber name and signature, respectively [26]. However, the results of a study conducted by Raja et al., 2019, showed that 0% and 1% of all handwritten prescriptions lacked prescriber

name and prescriber signature, respectively [17].

5. Patient's information –related errors

Complete patient's details on handwritten prescription are value. Age is an important factor in the selection of right medication for right patient due to several medications are not prescribed for some groups of patients such as pediatric and geriatric patients. Furthermore, some medications administered only to one gender, therefore, it is important to mention the patient gender on handwritten prescriptions [17, 23].

Table 4: Patient's information-related errors (n=429)

Missing detail	No. of errors	% of errors
Name	31	7.2
Gender	331	77.2
Age	298	69.5
Diagnosis	211	49.2

As illustrated in Table 1, 871 (23%) errors related to patient's details, with 2 errors per handwritten prescription. Failure to print gender, age, diagnosis of disease, and name of the patient encountered in 77.2%, 69.5%, 49.2%, and 7.2% of the handwritten prescriptions, as shown in Table 4.

These findings inconsistence with those in a previous study carried out in Yemen by Al-Worafi et al., 2018, showed that the commonly errors related to patient information in the handwritten prescriptions were due to failure in writing of diagnosis of disease (81.26%), followed by age (69.97%), gender (63.86 %) and name (22.13%) of patient [7].

However, these findings are somewhat not in line with what are reported in several previous studies. Irshaid et al., 2005, found that 5.4%, 22.7%, 34.0% and 48.7% of handwritten prescriptions were deficient in name, age, diagnosis and gender of patient, respectively [25]. Balbaid et al., 1998, mentioned that 14.5%, 10%, 6.8% and 4.1% of handwritten prescriptions were deficient in patient's name, age, diagnosis and sex of patient, respectively [26]. Mugoyela et a, 2008, reported that 2.9% and 1.6 % of handwritten prescriptions failure in writing of age and name of patient, respectively [6]. Another study conducted in Tanzania by Audax et al, 2019, revealed that the most common errors related to patient information was due to failure mention diagnosis of disease (41.1%), followed by age (3.9%) and name (0.40%) of patient [2].

In the other hand, Ansari et al, 2009, reported that there was no errors in writing patient's name, age, and gender [3], while Raja et al., 2019, reported that only 3.8%, 10.2 % and 11.2% of handwritten prescriptions lacked name, age and gender of patient, respectively [17].

6. Medication's information –related errors

Medication should administered to right patient at right dose. The duration of treatment is important content of a handwritten prescription. Therefore, it is prescriber's responsibility to correctly write the dose of medication and the duration of therapy on the handwritten prescription. [17].

In the present study, the medication information –related errors were high (52.2%), as showed in Table 1. The dose of medication and the duration of therapy did not write in 28.2% and 55.7% of the handwritten prescriptions, respectively, as seen in Table 5.

Table 5: Prescribed medication's information –related errors (n=429)

Missing detail	No. of errors	% of errors
Spelling	245	57.1
Dosage form	145	33.8
Strength	283	66.0
Strength unit	229	53.4
Dose	121	28.2
Route of administration	355	82.8
Dose interval (frequency)	123	28.7
Duration of therapy	239	55.7
Unauthorised abbreviations	236	55.0

These findings are higher compared to those in studies conducted by Mugoyela et al., 2008, by Ni et al., 2002, and by Balbaid et al., 1998, and by who reported that the dose of medication did not write in only 5.4%, 8.7%, and 7.6%, of handwritten prescriptions, respectively, while the duration of treatment did not mention in only 10.2%, 8.8% and 14.1% of handwritten prescriptions, respectively [6, 24, 26]. Raja et al., 2019, reported that only 3.6% and 1.8% of the handwritten prescriptions failed to provide information on dose, and the duration of treatment [17]. Al-Worafi et al., 2018, reported that duration of therapy did not mention in 65.79% of handwritten prescriptions [7].

Multiple routes of administration are used to give many medications. Thus, it is very important to choose proper route of administration of drug for each patient according to the severity of disease [17].

A study conducted in Yemen by Al-Worafi et al., 2018 [7], revealed that the rates in wrong spelling name (97.52%), dosage form (44.12%), frequency (83.74%), and route of administration (73.82%) of medication in handwritten prescriptions were higher than rates in the current study, which showed that wrong spelling name, and lacked dosage form, frequency, and route of administration of medication did not write in 57.1%, 33.8%, 28.7%, and 82.8% of the handwritten prescriptions, respectively, as outlined in Table 5.

A study conducted by Ansari et al, 2009, showed that the dosage form, frequency, route of administration, and wrong spelling of medication did not write in 12.1%, 10.4%, 62.6%, and 0.5 % respectively [3]. Audax et al., 2019, reported that dosage form, frequency and route of administration lacked in 67.1%, 3.8% and 46.4% of the handwritten prescriptions, respectively [2].

Furthermore, Ni et al., 2002, reported that dosage form, frequency, and route of administration of medication did not write in 36.4%, 5.3% and 80% of handwritten prescriptions, respectively [24]. Mugoyela et a, 2008, reported that 24.8%, 3.2% and 94% of errors related to patient were due to failure in writing of dosage form, frequency, and route of administration of medication respectively [6].

With the rapid advances in medication development, many medications are increasingly available in different strengths; hence, the lack of strength of medication may has some problems. Therefore, it is important to mention strength of a medication on the handwritten prescription, particularly when the medication is available in a various strengths In the other hand, if strength of a medication is written wrongly, it may lead to more serious consequences than if the strength is not write at all [17, 23].

Table 5 shows that strength and unit of strength of the prescribed medication did not write in 66.0% and 53.4% of handwritten prescriptions, respectively. These findings are

somewhat in line with a previous study carried out by Al-Worafi et al., 2018, showed that strength and strength unit of the prescribed medication did not mention in 75.52% and 72.22% of the handwritten prescriptions, respectively [7]. However, These findings are somewhat not in line with that in several previous studies. Audax et al, 2019, reported that 10.1% of errors in the handwritten prescriptions were due to failure to mention the strength of the prescribed medication [2], while, Ather, et al., 2013, reported that only 5.9% errors in the handwritten prescriptions were due to failure to mention the strength of medication [32]. Moreover, Raja et al., 2019, reported that the strength of medication, dosing frequency and route of administration lacked in 27.6%, 4.2% and 1.5 % of the handwritten prescriptions [17].

7. Authorized abbreviations –related errors

In the current study, unauthorized abbreviations were found in 55.0% of handwritten perceptions, as seen in Table 5 and 6.

Table 6: Authorized abbreviations –related errors (n=236)

Unauthorised abbreviation	No. of errors	% of errors
Mgm for (milligram)	55	23.3
T or Tb for (tablets)	67	28.4
C or C/p for (capsules)	24	10.2
Adv or T/T or DM for (Rx)	29	12.3
O/D (look like QID) for once daily dosing	31	13.1
P/O for (oral)	30	12.7

Similar results in study conducted by Ansari M, et al., 2009 [3]. However, Al-Worafi et al., 2018, reported that the errors of drug and unit abbreviations have been detected in 20.93% and 37.23% of the handwritten prescriptions, respectively [7].

Conclusion

There is a very low adherence rate with the legal and procedural requirements in the writing of prescription among the prescribers. This is support by a high incidence of prescribing errors in handwritten medical prescriptions at the study site. Each reviewed handwritten prescription has at least one or more of the prescribing errors. Illegible handwriting is a serious problem amongst all errors that detected in the handwritten prescriptions. The majority of detected errors in the writing of prescriptions are medication information –related errors. Although, absence of gender of patient on the handwritten prescription is the most common error of patient- related errors, qualification of prescriber is the major error among prescriber –related errors. Implementation of educational interventions such as workshops and continuous medical education programs for prescribers on standard prescription writing rules, implementation of electronic prescription system, and involving of a pharmacist in all steps of prescription writing process, will enhance quality, safety, and efficacy of the handwritten prescription and will help minimize the occurrence of the prescribing errors.

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