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ORIGINAL STUDY

Prevalence and Characteristics of Prescription Errors in Community Pharmacies in Mbarara City, South Western Uganda

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ABSTRACT

Background: A prescription error is a failure in the prescription writing process that results in a wrong instruction about one or more of the standard features of a prescription. Most adverse drug events are preventable through promoting rational drug use; primarily by mitigating the outstanding high burden of prescribing errors. The main aim of this study is to assess the prevalence and characteristics of prescription errors in the community pharmacies in Mbarara, Uganda.

Methods: A cross-sectional study was conducted in selected community pharmacies in Mbarara City, South Western Uganda. Consecutive sampling of all prescriptions available at the selected pharmacies was conducted until the total sampling target was achieved. A structured checklist adopted from the standard prescription guidelines according to the Uganda Clinical Guidelines was used to abstract data from the prescriptions.

Results: The study included 420 prescriptions from eleven community pharmacies in Mbarara City. The overall prevalence of prescription error was 64.3%. Out of 420 prescriptions analysed, 270 prescriptions had a total of 412 prescribing errors. Illegible or wrong drug name was the most prevalent form of prescription error (170, 40.48%) followed by missing or wrong route of administration (113, 26.9%). On the other hand, out of 985 prescription writing errors, 703 (71.4%) were errors of omission. The errors of commission accounted for 282 (28.6%) of the prescription writing errors: 156 (38.4%) had errors in name of the drug, and 58 (14.3%) had errors in prescriber's name among others.

Conclusion: The current prevalence of prescription errors is much higher compared to previously reported findings. This translates to suboptimal patient care and heightened risk of adverse drug events including the risk of antimicrobial resistance. This calls for strengthening health care systems to reduce prescription errors and prevent adverse drug events, including incorrect prescribing, drug interactions, antibiotic resistance, and treatment failure.

Keywords: Prescription error, Community pharmacy, Uganda

1. Introduction

The goal of drug therapy is to improve a patient's quality of life and rational medicine use is essential to

optimize quality of healthcare delivery and resource utilization [1]. According to the World Health Organization (WHO), more than half of all medicines are inappropriately prescribed, dispensed or sold

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with such practices deemed to be most prevalent in healthcare settings in the developing world where mechanisms for routine monitoring of medicines use are still in early stages of development [2, 3].

The prescription is a legal document comprising instructions for medication by a licensed medical practitioner to the pharmacist [4]. A standard prescription must contain: prescriber's information, date, patient information, superscript, inscription, subscription, transcription and signature [5].

A prescription error *“is a failure in the prescription writing process that results in a wrong instruction about one or more of the standard features of a prescription”* as described above [6]. The two types of prescription errors are errors of omission and errors of commission. Errors of omission are those with either missing indication or any incomplete drug information [7], while errors of commission are when the prescription contains wrongly written information for example wrong choice of drug, inappropriate dose, inappropriate dose schedule, wrong route, incorrect formulation, inappropriate abbreviation and illegibility of the prescription [8].

Medication errors cause at least one death every day and injure approximately 1.3 million people annually in the United States of America (WHO, 2017), of which 70% of are prescription errors [6, 9]. The incidence of prescribing errors has been reported to range from 3 to 99 errors per 1000 inpatient medication orders [10]. While low- and middle-income countries are estimated to have similar rates of medication-related adverse events to high-income countries, the impact is about twice as much in terms of the number of years of healthy life lost (WHO, 2017). Prescribing indicators for the African region deviate significantly from the WHO reference targets. This includes irrational prescribing and inappropriate use of drugs [11].

A study in emergency units in Riyadh Saudi Arabia revealed that 13.5% of every prescription reviewed had at least one prescription error. [12]. Studies reported from Ethiopia have reported a high prevalence of prescribing errors, with rates of 75.1% at Gondar Hospital [13] and 58.07% at Dessie Referral Hospital. At Dessie Referral Hospital, the most frequent problems were incomplete prescriptions (54.26%) and dosing errors (31.39%) in the pediatric ward [14].

Furthermore, in East Africa, a study done in Kili-manjaro region in Tanzania revealed that 99.6% of prescriptions had at least one prescription error [15]. In Uganda, a prevalence of 35.1% of prescription errors was found among nurses and physicians in Entebbe and Kisubi hospitals [16] and 42.31% among cancer inpatients at Mbarara Regional referral hospital [17].

Prescription errors are one of the causes of treatment failure that lead to frequent, serious, and expected events in critical care units which result in patient morbidity and mortality [18]. In addition It has economic impact on both patients and health care system estimated at 42 billion dollars per annum globally almost 1% of total global health expenditure (WHO 2017).

To the patient particularly, prescription errors can lead to increased costs of medication, ineffective treatment, prolongation of disease and distress [19]. In addition to weakening the patients' confidence in medical services, prescription errors also impose substantial costs between US\$ 6 billion and US\$ 29 billion per year in the US (WHO, 2014). A study in England reported that prescribing in primary health care accounted for most of the errors hence adverse drug events which are estimated to cost NHS about £98,462,582 [20].

A study done in African hospitals also revealed that prescription errors contribute to irrational use of medicines which can lead to antimicrobial resistance and yet, adverse drug events that occur as a result of prescription errors are preventable [21]. However, there is a paucity of study in Uganda about prescription writing and prescribing errors and therefore this study aimed at the assessment of prescription errors in Mbarara City, Uganda (Uganda NDA, 2023).

2. Methods

2.1. Study site and period

The study was conducted in 11 community pharmacies in Mbarara City located in South Western Uganda from June to July, 2023. These pharmacies mainly serve the population of Mbarara City which is approximated at 195,160 people as of the 2014 national population census. The prescriptions received at these pharmacies were mainly from the government hospitals (the regional referral hospital and health centers) and privately owned clinics and medical centers within Mbarara City. According to NDA, Mbarara district has a total of 105 registered community pharmacies as of 2023.

2.2. Study design

A cross-sectional study design was used to collect data from prescription forms presented at the selected community pharmacies.

2.3. Study population

The study population were prescription forms of patients of all age groups that were presented at the

selected pharmacies in Mbarara city during the study period. Community pharmacies in Mbarara City, located within one kilometer from a healthcare facility and Community pharmacies that granted us the permission to carry out the study within their facility and signed the consent form as evidence were pharmacies included in the study. Current prescription forms from clinics, hospitals or health centers that contained drugs prescribed for all age groups, prescriptions that contained at least one drug and, both handwritten and typed prescriptions were prescriptions included in the study while prescriptions that contained only sundries, prescriptions that were for drug refill and verbal prescriptions were excluded from the study.

2.4. Sample size determination and sampling technique

We used single population proportion formula to estimate the sample size required.

$$N = \frac{Z_{a/2}^2 P(1 - P)}{E^2} \text{ adopted from [22]} \quad (1)$$

Where n= required minimum sample size

P= the estimated prevalence of an indicator

a= level of significance

Z_a= the z-score corresponding to the degree of confidence

E= desired precision

The value of P was 0.33, given the prevalence of prescription errors in a study [23]

$$N = (2.17)^2 (0.33) (1 - 0.33) / 0.05^2$$

= 418 prescriptions that we approximated to 420 prescriptions.

We obtained our sample size from 11 selected community pharmacies in Mbarara City, considering at least 38 prescriptions from each. A convenience sampling was done for the divisions from which the pharmacies were selected. The target community pharmacies were those that deal in human medicine, are registered by the National Drug Authority and are within one kilometre from a health care facility.

2.5. Sampling procedure

We obtained the list of all the NDA registered pharmacies in Mbarara City from the NDA register on their website. We ordered them alphabetically using the Microsoft excel where they were given numbers and randomly selected 11 community pharmacies that sell

human medicine. For the pharmacies that fell within the inclusion criteria, we proceeded to collect data.

2.6. Data collection tool and procedure

In this study, we considered any errors in drug selection, indication, dose, frequency, route or duration as prescribing errors. Overall prescription error is when at least error in one of drug selection, indication, dose, frequency, route or duration. On the other hand, prescription writing error included any errors including commission and omission of prescriber's name, prescriber's qualification, and signature; name of health facility, prescription date, patient's name, patient's address, patient's gender, patient's age, drug name, indication, dose, dosage form, frequency, and duration. We obtained permission from the pharmacy management of the selected pharmacies who signed consent forms. We also obtained either verbal and/or written consent from the study participants to be able to assess their prescriptions.

A structured checklist adopted from the standard prescription guidelines according to the UCG was used to collect data from the prescriptions. It was divided into two subsections which included part A with the prescriber and patient demographic information as well as part B that entailed the drug information. Attached to the tool were a patient consent form; one in English and another in Runyankole.

2.7. Data quality control

Data were collected directly by trained members of the research team using standardized data collection procedures. To ensure data accuracy and completeness, all entries were reviewed daily through an independent double-checking process, whereby a second researcher verified the collected data against source documents and resolved any discrepancies through discussion with the original data collector. Regular team oversight further supported consistency and data integrity throughout the study period.

The patient/client consent form was translated in Runyakole/ Rukiga, local language, to ensure understanding of the participants.

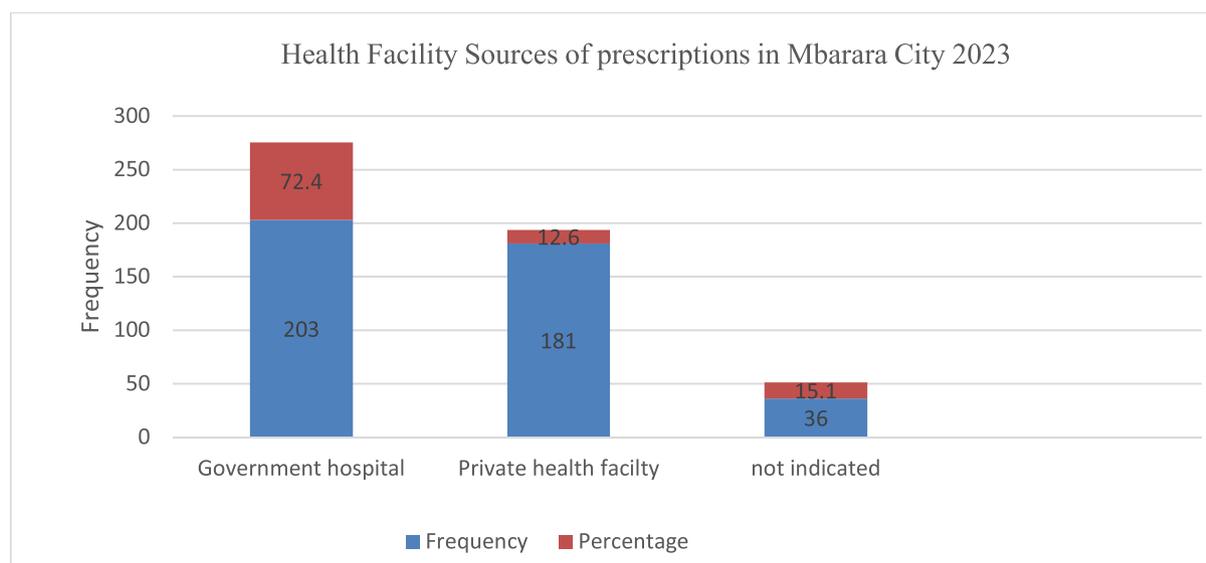
All checklists were labeled with numbers from 1-420 and equally distributed to different pharmacies. The exclusion criteria were strictly followed to avoid re-assessing the same prescription or assessing an invalid one.

2.8. Data analysis

The analysis was carried out using the SPSS 25.0 version statistics software and Microsoft excel. Each

Table 1. The characteristics of the study population.

	Variable	N (%)
Error rate	Prescriptions with errors	270 (64.3)
	Prescriptions without errors	150 (35.7)
Facility the prescription is from	Prescriptions from government facility	203 (48.3)
	Prescriptions from private facility	181 (43.1)
	Prescriptions without name of facility	36 (8.6)
Type of prescription	Handwritten prescriptions	415 (99)
	Typed prescriptions	5 [1]
The pharmacy locations (divisions) from which prescriptions were assessed	Kakoba	190 (45.2)
	Kakiika	38 (9.0)
	Kamukuzi	154 (36.7)
	Nyamitanga	38 (9.0)

**Fig. 1.** Health facility sources of prescriptions.

objective was analyzed individually and percentages, graphs and pie charts were obtained in order to explain the results. The prevalence of prescription errors was calculated as the percentage of prescriptions with at least one prescribing error in the part B (drug information) of the checklist. The prescriptions with errors of omission were considered as those that had at least one vital piece of information (either in part A or in part B or in both) missing according to the standard prescription writing guidelines. Those with errors of commission were considered as those that had at least one vital piece of information (either in part A or in part B or in both) wrongly written according to the standard prescription writing guidelines. We analyzed the classes of drugs most commonly found in prescriptions with prescription errors using the prescription error index which we calculated as the number of errors associated with the drug divided by the total number of times that drug was prescribed.

3. Results

The study included 420 prescriptions from the following 11 community pharmacies in Mbarara City: Wilbert pharmacy, Guardian pharmacy, Silver pharmacy, Spela pharmacy, Olive pharmacy, Toram pharmacy, Pecos pharmacy, Rwebikona pharmacy, D-plus pharmacy, Rohana pharmacy, and Stairs pharmacy. Majority i.e. 99% of the prescriptions were handwritten prescriptions (Table 1). The highest percentage (48.3%) of prescriptions was from Mbarara Regional Referral Hospital and Mbarara Health Centre government facilities. (Fig. 1).

3.1. Prevalence of prescription errors

The overall prevalence of prescription error in the current study is 64.3%. The 270 prescriptions had a total of 412 prescribing errors with the highest

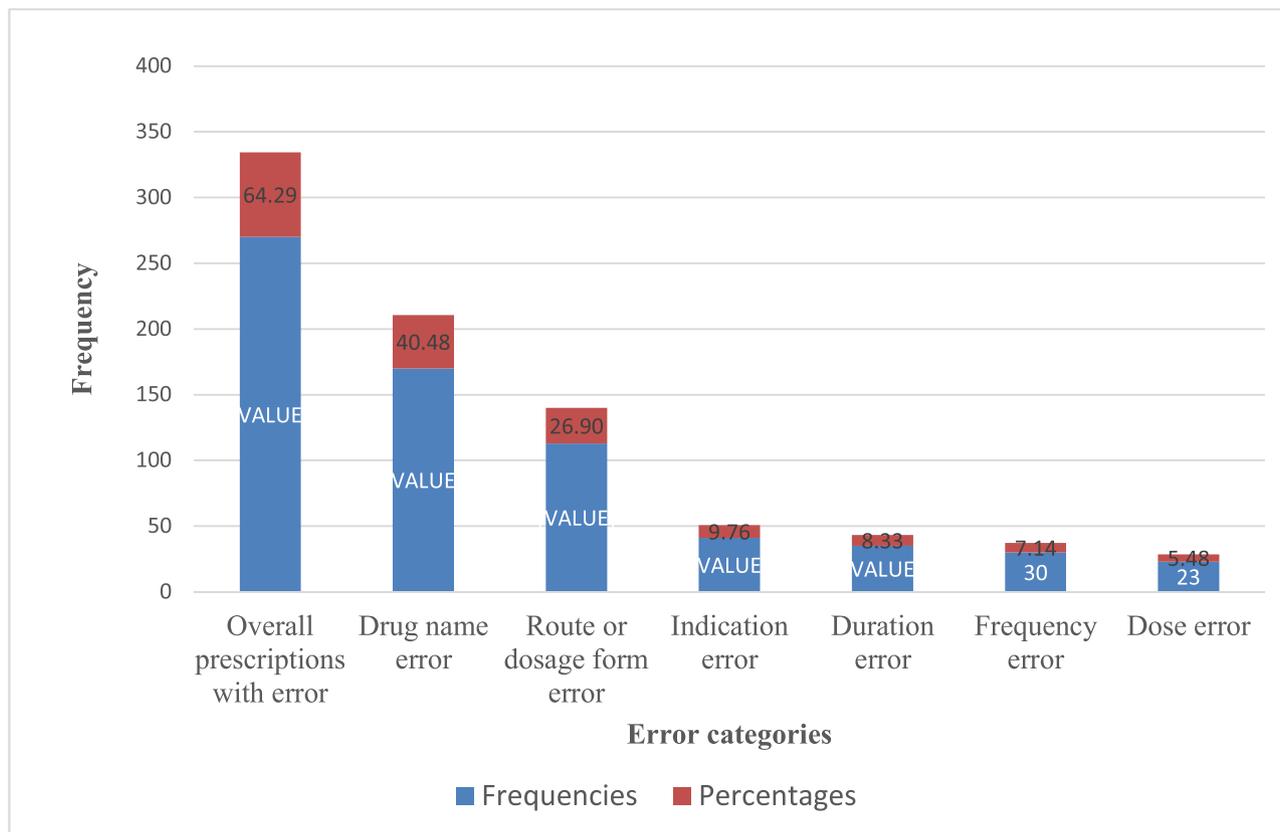


Fig. 2. Distribution of prescribing errors.

prevalence (170, 40.48%) being observed in the drug name followed by route of administration at (113, 26.9%) (Fig. 2).

3.2. Types of errors in the prescriptions

Out of 1425 prescription writing errors, 1178 (82.7%) were errors of omission which were due to missing information as follows; 200 (47.6%) prescribers name, 213 (50.7%) prescriber's qualification, 136 (32.4%) patients address and others as illustrated in the table while the errors of commission had a prevalence of 247 (17.3%)(Table 2).

3.3. 4.4 classes of drugs with prescribing errors

The most common classes of drugs in prescription with errors were antibiotics which were 102 (25.6%) followed by analgesics 55 (13.8%) (Table 3).

4. Discussion

In this study, out of 420 prescriptions, the prevalence of prescribing errors was 64.3%. This is in line with a study done among drug stores and community

pharmacies in Gondar, Ethiopia, where prevalence of 75.1% prescribing errors was noted [13]. Additionally, the prevalence of medication prescribing errors was consistent with a study done in the ICU of Jimma University specialized hospital was 52.5% [24].

However, our finding of prevalence is higher as compared to previous studies done at Mbarara Regional Referral hospital, where prevalence was 42.31% [17] and Arua Regional Referral at 36% [25]. A systematic review of the literature related to prescribing errors among adults in Saudi Arabia showed that Error rates varied from 7.1% to 94% for prescribing [26]. This may attributed to the fact that unlike the current study, the prescriptions from the previous studies were written by only specialist health professionals employed at the regional referrals who have access to standard treatment guidelines. Another study in Netherlands and two Jordan hospitals reported a lower prevalence of 35% [27] and 36.6% [28], respectively which was attributed to the use of typed e-prescriptions as opposed to handwritten prescriptions. Moreover, the study setting of the later study is more developed than our study setting. The outcome of our study calls for an action of the stake holders of both private and government institution to incorporate Continuous Medical Education (CME's)

Table 2. Types of prescription writing errors.

Variable	Correct (no error)	Omission Error (N)	Percentage %	Commission Error (N)	Percentage %
Prescriber's Name	178	200	47.6	42	10.0
Prescriber's Qualification	207	213	50.7	00	0.0
Health Facility	361	59	14	00	0.0
Prescription Date	388	32	7.6	00	0.0
Patient's name	386	31	7.4	3	0.7
Patient address	284	136	32.4	00	0.0
Patient Sex	319	101	24	00	0.0
Patient age	341	79	18.8	00	0.0
Rx	341	79	18.8	00	0.0
Drug Name	250	0	0	170	40.5
Dose	397	18	4.3	5	1.2
Dosage Form/ ROA	307	109	26	4	1.0
Frequency	390	20	4.8	10	2.4
Duration of administration	385	31	7.4	4	1.0
indication	379	32	7.6	9	2.1
Signature	383	37	8.8	00	0.0

Table 3. Classes of drugs with prescribing errors.

DRUG CLASS	Frequency of prescribing (M)	Frequency of errors (N)	Prescription error index (N/M)	Percentage error (N/420) %
Local anaesthetics	2	1	0.50	0.3
Analgesics	123	55	0.45	13.8
Anti-acids	65	42	0.65	10.6
Anti-asthmatics	7	4	0.57	1.0
Antibiotics	198	102	0.52	25.6
Anticoagulants	14	6	0.43	1.5
Anticonvulsants	16	8	0.50	2.0
Anti-emetics	14	7	0.5	1.8
Anti-epileptics	26	3	0.12	0.8
Antihistamines	12	7	0.58	1.8
Anti-hypertensives	90	38	0.42	9.5
Anti-malarials	14	8	0.57	2.0
Antipsychotics	42	17	0.40	4.3
Antispasmodics	32	20	0.63	5.0
Chemotherapy	22	9	0.41	2.3
Corticosteroids	32	4	0.13	1.0
Diuretics	30	11	0.37	2.8
Hormones	7	6	0.86	1.5
Hypoglycaemics	16	15	0.94	3.8
Opioids	22	1	0.05	0.3
Supplements	132	34	0.26	8.5
TOTAL		398		

to educate their health workers on the standard prescription writing.

The prescribing errors observed were in the drug name at 40.5% rate whereby wrongly written names, illegible handwriting, brand names and abbreviations were used as opposed to the use of generic names as is stipulated in the Ugandan Clinical Guidelines and WHO recommendations. The total number of prescription writing errors recorded during the study period was 1425, where by 82.7% were errors of omission. Similarly a study in Kilimanjaro revealed a 99.6% omission error rate [15].

The highest incidences of omissions were due to missing prescribers information i.e. 51.9%, 47.6%,

and 14% of the prescriptions did not have prescriber's qualification, name and address, respectively. This error made it impossible to confirm whether the prescriptions were written by qualified health professionals or not and the specific cadre that is involved in writing with errors. Omissions of vital patient information was the second highest cause of omission errors i.e. patient's sex (24.0%) and missing patient age (18.8%), which depict scenarios of either self-medication, unqualified or not properly trained prescribers, whereby such crucial information affects the drug choice, dose, indication and contraindications [29]. Our finding outcome suggests that health facilities should promote double checking of

prescriptions before dispensing of drugs. This will enhance correction of errors and inclusion of any important details that could have been missed out like age of patient, route of administration among others.

This study had a lower occurrence of errors of commission at 17.3%. Of these, the 40.5% was due to drug name was the highest whereby there were incidences of use of brand names, abbreviations and illegible handwriting which could predispose the patient to poor health outcomes including adverse drug reactions.

The current study revealed that the most common class of drugs involved in prescription errors was antibiotics at a percentage of 25.6% followed by analgesics at 13.5%. Similarly, a study done in Ethiopia, antibiotics were also the most common class of drug involved in prescribing errors at 63.5% followed by analgesics (44.5 %) [13]. This may be owed to the fact that antibiotics have the highest incidence of being prescribed in Uganda (45%) as well as other African countries; Zambia (57%), Ghana (55%) and Tanzania (30%) as compared to other drug classes [30]. These errors have been due to irrational prescribing of antibiotics which has also been observed to be at 68.4% in Mbarara health centre 3 & 4, mostly prescribed for upper respiratory tract infections by Nurses. [31]. This coupled with errors in the writing of the drug name, and dosing errors are among major health professional related factors contributing to the increasing incidence of antimicrobial resistance(5). The errors are attributed to negligence causing incorrect dosing, lack of sufficient knowledge on antimicrobial use and dangers of irrational prescribing [32].

In addition, in this study many prescriptions had abbreviations being used for antibiotics for example; CTX for Cotrimoxazole, CAF for chloramphenicol, Levo for levofloxacin which can easily be confused for levothyroxine, levocetirizine or levetiracetam by the dispenser especially when doses are not attached and for analgesics PCM to mean paracetamol, Diclo for Diclofenac. The 10.6% error rate observed in antiulcer drugs was also mainly contributed to by abbreviations in proton pump inhibitors for example Esoz for esomeprazole, omez for omeprazole. This was also revealed in a study done in south India that had 29.2% [33] and in Sri Lanka 35.6% [34] of the errors caused by use of abbreviations. This complicates prescription interpretation.

In this study errors also occurred due to the use of brand names instead of generic names of antibiotics for example; augmentin a brand for Amoxicillin + clavulanic acid, flagyl or metrogyl for metronidazole, epicephin for ceftriaxone IV, and analgesics for example Gofen a brand of Ibuprofen 400mg, Voltaren a brand for diclofenac. Another study also revealed that 22.5% of prescribing errors were due to use of brand

names(33). This can be attributed to the influence of drug marketers that give prescribers incentives to prescribe particular brands of the drugs. In addition, some prescribers have a perception that brand drugs have higher efficacy as compared to generic drugs.

The study's limitation include that some pharmacies had no major health center within a radius of 1km hence excluding them from the study and it didn't explore to assess the factors associated to the prescription errors. Moreover, the study included only 11 pharmacies out of the 105 pharmacies in Mbarara, and this limits the generalizability of the study. Despite the limitations, the study was able to add a pertinent information on the status of the prescription errors in community pharmacies in Mbarara, Uganda.

5. Conclusion

Overall, the study findings revealed that there was a high prevalence of prescription errors received by community pharmacies in Mbarara city. Errors of omission were the most reported type of errors and antibiotics was the most common class of drugs with prescription errors followed by analgesics. This could be attributed to lack of proper systems of streamlining health professionals that prescribe contributing to high prevalence of errors in prescription in both private and government facilities. Combating the high prevalence of prescription errors will protect patients from adverse drug events that arise due to incorrect prescriptions, allergic reactions, drug interactions, antibiotic resistance, and treatment failure.

Abbreviations

ADE: Adverse Drug Effects, ADR: Adverse Drug Effects, AMR: Anti-Microbial Resistance, BNF: British National Formulary, CVS: Cardiovascular System, DADI: District Assistant Drug Inspector, ED: Emergency Department, FOM: Faculty of Medicine, GIT: Gastro Intestinal Tract, HC: Health Centre, HF: Health facility, MUST: Mbarara University of science and technology, NDA: National Drug Authority, P.A: Per Annum, PHC: Primary Health Care, UCG: Uganda Clinical Guidelines, URTI: Upper respiratory tract infection, USA: United states of America, WHO: World Health Organisation.

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the community pharmacy staffs for their cooperation during the data collection process.

Consent for publication

All participants agreed about anonymous publication of the study findings. All authors agreed to submit this version of the manuscript for publication.

Competing interests

All authors declare that they have no conflict of interest.

Ethics declarations

Ethical approval

This study was conducted in accordance with the Declaration of Helsinki. Ethical clearance was obtained from the Ethics Committee of Department of Pharmacy, Mbarara University of Science and Technology. Thereafter, we sought permission from the management of the selected pharmacies to carry out the study in their premises. For each prescription, we had the clients sign consent forms for data to be collected from their prescriptions. The confidentiality of client information was ensured by use of patient initials instead of names while collecting the data and the prescriber details were not recorded.

Availability of data and materials

The data that support the findings of this study are available on request from the corresponding author.

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The authors received no financial support to conduct this study and used personal resources.

Authors' contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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