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Original Research Article

Assessment of Prescription Errors in the Internal Medicine Department of a Tertiary Care Hospital in Nepal: A Cross-Sectional Study

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ABSTRACT:

Introduction: Prescription errors are common problems in hospitals that lead to increase in morbidity, mortality and treatment cost. They also reduce faith towards healthcare providers. They are avoidable and their adverse outcomes can be reduced if assessed and recognized earlier. This study was conducted to assess prescription errors occurred in a tertiary care hospital in Nepal. **Methods:** A cross-sectional study was conducted in the Internal Medicine Department of Lumbini Medical College over five months of duration. Patients who were prescribed at least one drug in the prescription form were included. **Results:** Out of 425 patients, prescription errors were seen in 168 (39.5%) cases. Among the prescription errors, 160 (37.6% of all prescriptions) were the errors of omission. Errors of omission, due to missed dose of the drug were observed in 111 prescriptions (26.1%). Regarding the severity of medication errors, category B errors were the most common (21.6%). Prescriptions to patients with one diagnosis were less likely to have prescription errors compared to those with more than one diagnosis ($p = 0.0002$). Observed frequency of prescription errors was higher among patients with polypharmacy ($p < 0.001$) and Fixed-Dose Drug Combination ($p < 0.001$). The observed frequency of errors of omission was also higher among patients with more than one diagnosis ($p = 0.0002$), patients with polypharmacy ($p < 0.001$) and patients who were prescribed Fixed-Dose Drug Combinations ($p < 0.001$). **Conclusion:** About one-third of the patients had prescription errors. Among them, errors of omission were the most common.

Keywords: Error of omission, Medication error, Prescriptions, Tertiary hospital

INTRODUCTION:

National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defined medication errors (MEs) as "Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use".[1,2] Many factors are responsible for generating MEs such as health worker's workload, poor knowledge about drugs, irrational use of drugs, poor communication between healthcare providers and patients, pressure of time management, inadequate knowledge of disease and complexity of disease.[2] According to data of WHO, MEs generally produce adverse

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effects of drugs in approximately one million people every year worldwide including low- and middle-income countries.[3]

Among MEs, prescription errors are common which are of two types; errors of omission and errors of commission.[4] If essential information is missed in the prescription, it is called error of omission, while errors of commission occur if wrong information is written in the prescription.[4] Prescription errors lead to increase in adverse effects of drugs, morbidities, mortalities and burden of treatment costs. Beside this, they also lead to reduced faith of patients towards healthcare providers and increased wastage of public money.[4,5] If assessments of those errors are made by authorized healthcare professionals in regular interval, they can be identified and corrected. So, in future, the harmful outcomes of those errors can be prevented and minimized.[6,7] These regular assessments also reduce existing gap of belief between healthcare providers and patients. Many studies related to prescription error rates have been conducted in hospitals worldwide, but sufficient studies are not available for low-and middle-income countries, despite those countries have increased practice of using medications. Moreover, only few studies have been found in tertiary level hospitals of Nepal.[4,6] Thus, this study was conducted with general objective to provide the understanding of prescription errors in Internal Medicine Department of Lumbini Medical College and Teaching Hospital (LMCTH). While the specific objectives were to evaluate prevalence of prescription errors that include errors of omission as well as errors of commission, to assess the level of severity of medication errors and to study their association with socio-demographic/clinical characteristics of the patients.

METHODS:

A cross sectional study was conducted in Internal Medicine Department of LMCTH, Tansen, Palpa after an approval letter was received from Institutional Review Committee (Protocol No: IRC-LMC 14-G/020). An approval letter was also received from the Head of the Department of Internal Medicine to conduct the study. The study was conducted for the duration of five months from August, 2020 to January, 2021. The study included the data of: patient who visited the Internal Medicine Out-Patient Department (OPD) irrespective of age, gender and diagnosis, patient encountered first time by researchers, follow up patient encountered first time by researchers and patient prescribed at least one drug in OPD prescription form. While, follow up patient encountered previously during first visit, patient prescribed no drug in OPD prescription form and patient treated in Internal medicine In-Patient department were excluded.

The sample size was calculated using the following formula (when population was unknown) as demonstrated in the articles published by Sheikh et al. and Degu et al.[7,8]:

$N = Z^2 P (1-P) / d^2$

Where,

N = Minimum sample size required for accuracy in estimating proportions

Z = Standard normal value for 95 % confidence interval (1.96),

P = Proportion of population possessing characteristics of interest, 0.5 (50%),

1-P = Proportion of population that do not possess the characteristics of interest,

d = Margin of sampling error tolerated, 0.05 (5%)

Hence, the minimum sample size required was 384.

A convenience sampling technique was used for collection of the data. The primary data were collected from Health Insurance Section of LMCTH and recorded in pre-designed Case-Proforma. The Case-Proforma consisted of information about socio-demographic profile of patients, diagnosis of disease and findings related to prescription errors. Each prescription was checked two times to find if prescription contained any error. All the processes were done by researchers themselves. All the data were kept confidential and anonymous by keeping code numbers in place of name and address of the patient. However, hospital numbers were recorded for the proof that data were original.

Prescription errors namely errors of omission and errors of commission were included in Case-Proforma as found in the study conducted by Ansari et al., Sheikh et al., and Sapkota et al.[6,7,9]:

1. Errors of omission (Essential information is

missed in the prescription form.):

- Related to prescriber
- Patient name not mentioned
- Age not mentioned
- Prescription date not mentioned
- Diagnosis not mentioned
- Prescriber name not mentioned
- Department not mentioned
- Prescriber signature not mentioned

- Related to drugs per total medicine dispensed
- Dose not mentioned
- Frequency not mentioned
- Dosage form not mentioned
- Quantity to supply not mentioned

2. Errors of commission (Wrong information is written in the prescription form, some examples of which are given below.):
   The possible causes for this type of errors are high workload of doctors, distraction of mind due to multiple duties of doctors, time pressure because of increased numbers of patients visiting to the OPD and interruption by patients, patient's relatives and other hospital staffs while prescribing the drugs).

- Wrong strength (Example: Dose of thyroxine is written in milligram in place of microgram)
- Wrong drug name (Example; Metoprolol is written in place of metronidazole)
- Wrong Dosage form
- Potential drug-drug interaction

Both errors of omission and errors of commission made in the act of writing the prescription form were analyzed. The treatment guidelines for the disease or medical decisions were not taken into consideration during assessment of errors.

Further, level of severity of the medication errors was assessed by using internationally validated NCCMERP index.[2,10] This index contains nine categories from category A to category I as described below:

- Category A: Circumstances that have potential to cause medication errors. This circumstance causes no harm to the patients.
- Category B: An error occurs but does not reach the patient. This error causes no harm to the patient.
- Category C: An error occurs and reaches the patient but does not cause any harm to the patient.
- Category D: An error occurs that reaches the patient and needs monitoring to confirm that the error causes no harm to the patient. This error also requires intervention to prevent harm.
- Category E: This category includes error that may contribute or result in temporary harm. These errors may require intervention to prevent them.
- Category F: An error occurs that may contribute to or result in temporary harm and requires initial or prolong hospitalization of patient.
- Category G: An error occurs that may contribute to result in permanent harm to the patients.
- Category H: An error occurs that requires intervention necessary to sustain life.
- Category I: An error occurs that contributes or causes the patient's death.

Once data were collected, they were entered in and analyzed by Statistical Package for Social Sciences (SPSS), version 18. Basic socio-demographic variables (age, sex, ethnicity of the patients), clinical characteristics (presence of multiple illnesses, prescription of five or more drugs i.e. polypharmacy, prescription of Fixed-Dose Drug Combinations) were described. Prescription errors and their associations with various socio-demographic and clinical characteristics were then analyzed. Categorical variables were expressed as frequency and percentage. Continuous variables were reported in terms of mean and standard deviation (SD). For inferential statistics, independent t-test and chi-square test were used as appropriate. p value less than 0.05 was considered as statistically significant.

RESULTS:

A total of 425 prescription forms were observed. Of them, 53.4% were of males and 69.2% patients were above 50 years of age (Table 1). Mean age ± SD of patients was 57.4 ± 16.9 years. Moreover, 56.2% of patients were found with more than one diagnosis and 46.8% of total patients were prescribed five or more than five drugs (polypharmacy) as shown in Table 1. Fixed-Dose Drugs Combinations (FDC) were found to be prescribed to 49.2% of the patients (Table 1). The most common FDC was Salmeterol + Fluticasone (12%) followed by Amlodipine + Losartan (10.1%)

Table 1. Socio-demographic and clinical characteristics of patients (N = 425).

Characteristics	Numbers (%)	Statistics
Age group (in years)		
1-10	4 (0.9)	
11-20	5 (1.2)	
21-30	24 (5.7)	
31-40	37 (8.7)	
41-50	61 (14.3)	
>50	294 (69.2)	
Mean age ± SD (in years)	57.4 ± 16.9	
Gender		
Female	198 (46.6)	
Male	227 (53.4)	
Mean age of female ± SD (in years)	56.3 ± 17.3	*t = -1.29, df = 409.71, p = 0.198*
Mean age of male ± SD (in years)	58.4 ± 16.5	
Ethnic groups		
Brahmin	145 (34.1)	
Chhetri	129 (30.4)	
Newar	37 (8.7)	
Others	114 (26.8)	
Number of diagnosis		
One	186 (43.8)	
More than one	239 (56.2)	
Polypharmacy		
Five or more than five drugs	199 (46.8)	
Less than five drugs	226 (53.2)	
Fixed-Dose Drugs Combination (FDC)		
Yes	209 (49.2)	
No	216 (50.8)	
Average number of drugs prescribed per encounter	4.4 ± 2.2	

In 168 (39.5%) patients prescription errors were seen. Among prescription errors, 160 (37.6%) patients were found with error of omission and 13 (3.1%) patients with errors of commission. Five patients were found with both errors of omission and errors of commission. Average number of medication errors per prescription was 1.60 ± 0.48. Furthermore, among errors of omission, dose of the drug was not mentioned in 111 (26.1%) patients, while among error of commission wrong dose was prescribed in 12 (2.8%) patients (Table 2). The level of severity of medication error, according to NCC MERP Index, was analyzed and it showed Category B in 92 (21.6%) patients, Category A in 74 (17.4%) and Category C in 2 (0.5%).

Patients with only one diagnosis were less likely to be found with prescription errors compared to the patients with more than one diagnosis (X^2[N = 425, df = 1] = 13.72, p = 0.0002) as demonstrated in Table 3. The prescription errors were more likely presented among patients with polypharmacy compared to patients without polypharmacy. This association was found statistically significant (X^2[N = 425, df = 1] = 25.37, p < 0.001). Patients who were prescribed FDC were more likely found with prescription errors compared to patients who were not prescribed FDC (X^2[N = 425, df =1] = 43.89, p < 0.001) as shown in Table 3. Similarly, errors of omission were more likely presented among patients with more than one diagnosis compared to one diagnosis (X^2[N = 425, df =1] = 13.23, p = 0.0002), among patients with polypharmacy compared to patients without polypharmacy (X^2[N = 425, df =1] = 23.34, p < 0.001) and among patients who prescribed FDC compared to patients without prescribing FDC (X^2[N = 425, df =1] = 41.88, p < 0.001) as demonstrated in Table 3

DISCUSSION:

The aim of this study was to provide the understanding of prescription errors in Internal Medicine Department of a tertiary care hospital. In our study, about two-third of the patients were above 50 years of age. The reason behind this might be that the data were collected during the COVID-19 pandemic and the majority of the patients were the follow up patients with the diagnosis of chronic health conditions like hypertension, diabetes, chronic obstructive pulmonary diseases etc. who visited the hospital to refill the drugs under their health insurance scheme. Our study demonstrated almost equal distribution of the genders with male to female ratio 1.1:1. The average number of drugs prescribed per encounter was 4.4 ± 2.2. This finding was higher than the average number of drugs prescribed per

Table 2. Distribution of prescriptions errors among patients (N = 425)

Error of omission			
Related to prescriber		**Related to drugs per total medicine dispensed**	
Variables	**n (%)**	**Variables**	**n (%)**
Patient name not mentioned	0 (0)	Dose not mentioned	111 (26.1)
Age not mentioned	0 (0)	Frequency not mentioned	0 (0)
Prescription date not mentioned	0 (0)	Dosage form not mentioned	23 (5.4)
Diagnosis not mentioned	0 (0)	Quantity to supply not mentioned	0 (0)
Prescriber name not mentioned	21 (4.9)		
Department not mentioned	0 (0)		
Prescriber signature not mentioned	5 (1.2)		
Errors of Commission			
Variables		**n (%)**	
Wrong strength or dose		12 (2.8)	
Wrong drug name (not spelling)		0 (0)	
Wrong Dosage form		0 (0)	
Drug-drug Interaction		1 (0.2)	

Table 3. Association of socio-demographic and clinical characteristics with prescription errors, errors of omission and errors of commission

Characteristics	**Medication errors**			**Errors of Omission**			**Errors of Commission**		
	Yes	No	Statistics	Yes	No	Statistics	Yes	No	Statistics
Age (in years)									
≤ 50	38	93	$X^2 = 8.77$, $df = 1$, $p = 0.003$	35	96	$X^2=9.63$ $df = 1$, $p = 0.002$	5	126	$p = 0.550$
>50	130	164		125	169		8	286	
Gender									
Female	80	118	$X^2 = 0.11$, $df = 1$, $p = 0.731$	77	121	$X^2 = 0.24$, $df = 1$, $p = 0.622$	7	191	$X^2 = 0.28$, $df = 1$, $p = 0.594$
Male	88	139		83	144		6	221	
Number of Diagnosis									
One	55	131	$X^2 = 13.72$, $df = 1$, $p = 0.0002$	52	134	$X^2 = 13.23$, $df = 1$, $p = 0.0002$	3	183	$X^2 = 2.33$, $df = 1$, $p = 0.127$
> One	113	126		108	131		10	229	
Polypharmacy									
≥ Five drugs	104	95	$X^2 = 25.37$, $df = 1$, $P < 0.001$	99	100	$X^2 = 23.34$, $df = 1$, $p < 0.001$	8	191	$X^2 = 1.16$, $df = 1$, $p = 0.280$
< Five drugs	64	162		61	165		5	221	
Fixed- Dose Drugs Combinations									
Prescribed	116	93	$X^2 = 43.89$, $df = 1$, $p < 0.001$	111	98	$X^2 = 41.88$, $df = 1$, $p < 0.001$	9	200	$X^2 = 2.15$, $df = 1$, $p = 0.142$
Not prescribed	52	164		49	167		4	212	

encounter calculated by using WHO prescribing indicators. The ideal WHO value is 2.[11] This finding was also nearly reflecting the practice of polypharmacy. Polypharmacy is the concurrent use of multiple drugs; five or more than five.[12] This practice is likely while prescribing drugs among old aged persons because they have higher chances to be affected by multiple diseases. Furthermore, polypharmacy may cause prescription errors by healthcare providers because when more numbers of medicines are prescribed, chances of creating errors are also higher.

In this study, prescription errors were observed in about one-third of the patients. The findings of a few studies were dissimilar to our study, where more than two-third of the patients had prescription errors.[13,14]However, two studies had demonstrated results related to the frequency of prescription errors similar to our study.[15,16] Prescription errors occur from circumstances like mistakes, lapses and slips.[1] They are avoidable and can be minimized if assessed by clinical pharmacologists because they have deep knowledge of medicines, their therapeutic responses, their adverse effects and drug interactions.[1,3] So the team of clinical pharmacologists, doctors, nurses, paramedics and administration personnel will become effective if they work collectively to achieve common goal of preventing or minimizing errors during drug prescriptions.

Among the prescription errors, our study displayed that errors of omission were higher. The similar types of results have been found in some studies.[4,7,8,14,15,17] The reason behind this may be that, in majority of those prescriptions, doses of drugs and prescriber's name/signatures were missing because of pressure of increased numbers of patients visited to OPD, increased workload and mismanagement of time. Whereas, few studies contradicted with our findings that showed errors of commission were predominant.[13,18] Among errors of omission, dose of the drugs was not mentioned in about one-fourth of prescriptions. The reason for this finding was that the doses of the drugs were missed in one of the drugs of FDC. For example, in our study, fixed dose combination of salmaterol and fluticasone was commonly prescribed. In prescription form, dose of salmaterol was mentioned, but dose of fluticasone was missed to mention. To avoid prescription errors, doses of both drugs of FDC should be written. Prescription errors may occur unknowingly while working under unfavorable environment. Awareness of the possibility of such prescription errors may be useful to minimize the same in the future.

To the researcher's best knowledge, only one potential event that may cause drug-drug interaction was observed in our study. In contrast to our study Shrestha et al. and Pote et al. found that there were higher numbers of drug-drug interactions (10.2% and 68.2% respectively).[4,16] However, drug interaction found in our study did not have potential to cause any harm to the patient. The potential drug interaction was between sucralfate and proton pump inhibitor. This drug interaction reduces therapeutic response of sucralfate because proton pump inhibitor raises pH of stomach to more than 5. Hence, the effect of sucralfate is reduced because it acts at pH less than 5. Drug-drug interactions should not be ignored because they have potential to diminish therapeutic response, produce adverse effects or even fatal problems.[9] They should be evaluated with special attention in order to prevent them.

Moreover, our study also demonstrated that more than one-third of all of the cases showed some levels of severity of medication error according to NCC MERP Index. The majority of errors belonged to Category B (21.6%) followed by Category A and Category C but none to more severe categories. One study conducted by Shrestha et al. supported finding of our study and demonstrated that about two-third of errors belonged to Category B.[14] Whereas, in contrast to our study, some studies showed that majority of errors belonged to Category C.[7,15,18] In NCC MERP Index, Category A defines "any circumstances that have the capacity to cause error", while Category B indicates that "an error occurred but it did not reach the patient".[2] According to NCC MERP Index Category A, B, C and D do not cause any harm to the patient, while Category E, F, G, H and I cause temporary harms or permanent harms or even death of patients[2,9]

Single out-patient department-based study design, short duration of the study and convenience sampling method are the limitations of our study. Besides this while analyzing the errors of commission, we assessed only the errors made in the act of writing the prescription regardless of the medical decision made.

CONCLUSION:

Our study found that about one-third of patients had prescription errors. Among them, errors of omission were the most common. Errors of omission were more likely among patients who were prescribed five or more than five drugs, who were diagnosed with more than one disease and who were prescribed fixed-dose drugs combinations. We suggest that collaborative program be conducted among the physicians, clinical pharmacologists, nursing staff, paramedical staff and hospital administration as an effort to minimize prescription errors as this practice has been supported by previous studies.

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