

## Medication error in general medicine department of tertiary care Koshi Zonal hospital in Nepal

Mohammad Mustafa<sup>1</sup>, Kajiram Adhikari<sup>1</sup>, Anil K. Sah<sup>1</sup>,  
Kadir Alam<sup>2\*</sup>, Rajesh Jha<sup>3</sup>, Deependra P. Sarraf<sup>2</sup>

<sup>1</sup>Department of Pharmacy, Purbanchal University College of Medical and Allied Sciences, Purbanchal University, Morang, Nepal

<sup>2</sup>Department of Clinical Pharmacology and Therapeutics, B. P. Koirala Institute of Health Sciences, Dharan, Nepal

<sup>3</sup>Kansas College of Osteopathic Medicine, Wichita, KS, USA

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**\*Correspondence:**

Dr. Kadir Alam,

Email: [alamkad2050@gmail.com](mailto:alamkad2050@gmail.com)

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### ABSTRACT

**Background:** Medication errors are the leading cause of patient harm, injuries and even death in hospitalized patients. It endangers patient safety and also increases the cost of treatment leading to enhanced financial burden to the individuals and the community as well. The study was aimed to determine the pattern of occurrence of medication errors.

**Methods:** A cross-sectional study was conducted in 188 hospitalized patients in medical ward at a Zonal Hospital. Medication errors were identified and categorized by reviewing the cardex. The data were analyzed to determine the cause of medication errors including rates of harm to patients. The descriptive statistics frequency and percentage were calculated using Microsoft Excel 2007. The findings were presented as tables and graphs.

**Results:** A total of 985 medication errors were found in 650 (38.3%) drugs prescribed in 177 (94.1%) patients. Approximately 72.9% of the errors reached the patients and 32.39% of the errors were harmful. The most common observed errors were administration errors (41.6%) followed by prescribing errors (36.5%), transcription errors (14.3%) and monitoring errors (7.5%). Omission of prescribing information (63.88%) and wrong dosing schedule (34%) were the most common type of prescribing and transcription errors respectively. Omission of dosages administration (57.32%) to patients was the most common types of administration error. All types of medication errors were highest in the alimentary tract and metabolism class of drugs (32.39%).

**Conclusions:** Medication errors were associated with the majority of hospitalized patients signifying the requirement of immediate preventive strategies and policies to ensure patient safety.

**Keywords:** Inpatients, Medication errors, Nepal, Patient harm, Patient safety

### INTRODUCTION

Medication error is defined 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 health care professional, patient, or consumer.<sup>1-3</sup> A medication error can cause hazardous outcomes at any stage of pharmacotherapy.<sup>4,5</sup> It is a serious concern in

developed as well as low- to middle-income countries like Nepal. It can result in an increased risk of drug-drug interactions, elevate the frequency of hospital visits and admission, prolong the hospital stay and increase the management cost and risk of mortality.<sup>6,7</sup> The burden and harm due to medication error is preventable and controlling medication errors can have a huge impact on the utilization of the healthcare system. The first step to

prevent medication errors and to ensure the safety of patients is to understand the medication errors associated with the various stages of pharmacotherapy.<sup>8</sup> The data on medication error is scarce in our context. The objective was to determine the pattern and causes of medication errors in hospitalized patients.

## METHODS

A descriptive cross-sectional study was conducted among hospitalized patients in the medical ward, Koshi Provincial Hospital at Biratnagar, Nepal from April 2019 to October 2019. The patients admitted to the ward were enrolled in the study. The patients transferred to the other wards for the treatment, outpatients and the patients whose data were incomplete or the required information was missing were excluded. A simple random sampling method was used. After briefing the objective of the study, written informed consent was taken from the patient. A self-designed data collection form was used to collect the demographic data and other required information after reviewing medical and nursing cardex and patient admission forms. The data were entered into Microsoft Excel 2007 and analyzed to calculate the descriptive statistics like frequency and percentage. Different types of medication errors were determined manually for each drug prescribed to patients by using the 'Medication Error Tracking Form' designed and adopted based on the California Health Care Foundation (CHCF).<sup>9</sup> On the basis of possible causes, the medication errors were categorized into prescribing error, transcribing error, dispensing error, medicine preparation error, administration error, and monitoring error using CHCF criteria.<sup>9</sup> Using National Coordinating Council for Medication Error Reporting and Prevention Classification (NCC MERP), the medication errors were also categorized into four major categories: no error but capacity to cause an error, error but no harm, error and harm, error and death.<sup>10</sup> Anatomical Therapeutic Chemical Classification was used to classify the medicines involved in medication errors.<sup>11</sup>

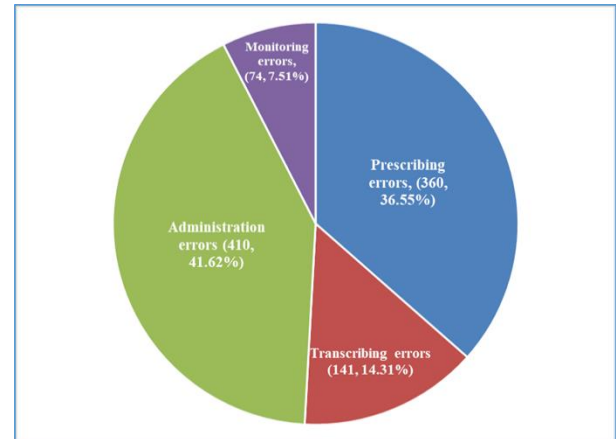
## RESULTS

A total of 1696 drugs were prescribed to 188 patients. About 985 medication errors were observed in 650 (38.33%) drugs prescribed in 177 (94.15%) patients. Out of 985 medication errors, administration errors (41.6%) were the most common (Figure 1).

The omission of prescribing information (63.88%) was the most common type of prescribing errors. The wrong dosing schedule (34%) was the most common type of transcription error. Omission of doses administration (57.32%) to patients was the most common type of administration error (Table 1).

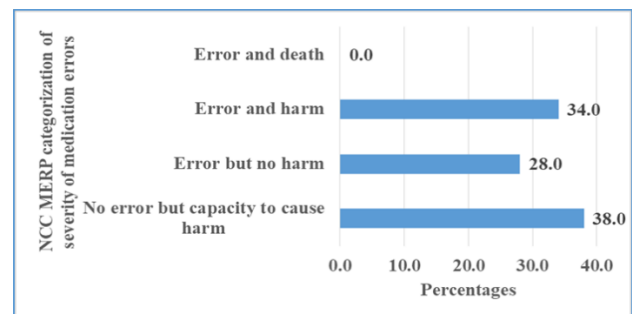
The frequency of medication errors reported in the most commonly prescribed drugs were pantoprazole (33.3%), ipratropium (20.3%), ranitidine (18 %), paracetamol (15.2%), azithromycin (13.5%), ceftriaxone (10.7%),

ondansetron (10.7%), tazobactam (9%), furosemide (8.5%) and vitamin B-complex (3.4%). Some examples of medication errors are given in the (Table 3).



**Figure 1: Types of medication errors (n=985).**

Out of 985 errors, 718 (72.9%) of the errors reached the patient. Based on the NCC MERP, errors were absent but had the capacity to cause harm in 38% of the incidents. No deaths were recorded due to medication errors (Figure 2).



**Figure 2: Category of medication error according to the severity of the outcome (n=985).**

## DISCUSSION

The present study indicated that medication errors occurred in the majority (94.1%) of the patients. More than one-third (38.33%) of the prescribed drugs were associated with medication error. The rates of medication errors in different other studies varied greatly from 11.57% to 67%.<sup>12-14</sup> Similarly, a systemic review reported that the prevalence of medication errors ranged from 2% to 94%.<sup>8</sup> These differences between rates of medication errors in various studies might be due to variations in definition and classification of medication error.<sup>6,8,15</sup> The most common medication error in this study was at the administration (41.6%) stage of pharmacotherapy which was consistent with another study (50%).<sup>4</sup> Similar results were also reported in other studies.<sup>12,13,16</sup> In contrast to this, other studies revealed higher medication errors in the prescribing stage (53.4% and 65%) of pharmacotherapy.<sup>17,18</sup>

**Table 1: Types of prescribing, transcribing and administration errors.**

Types of medication errors		N	% <sup>§</sup>	%* <sup>*</sup>
<b>Prescribing errors</b> (N=360)	Wrong dose/dose not adjusted	50	13.89	5.08
	Wrong dosing schedule	51	14.17	5.18
	Wrong/inappropriate route	20	5.56	2.03
	Inappropriate dosage form	2	0.56	0.20
	Duplication	7	1.94	0.71
	Omission	230	63.88	23.35
<b>Transcribing errors</b> (N=141)	Transcribed for wrong drug	19	13.48	1.93
	Transcribed for wrong dose	36	25.53	3.65
	Wrong dose schedule	48	34.04	4.87
	Transcribed for wrong route	4	2.84	0.41
	Transcribed with omission	34	24.11	3.45
<b>Administration errors</b> (M=410)	Dose omission	235	57.32	23.86
	Wrong medicine	13	3.17	1.32
	Wrong dose administered	23	5.61	2.34
	Wrong schedule	14	3.41	1.42
	Wrong route	34	8.29	3.45
	Extra doses/duplication	91	22.20	9.24

<sup>§</sup>Percentage of errors calculated out of respective errors (prescribing, transcribing, administration, and monitoring errors); <sup>\*</sup>Percentage of errors calculated out of total errors (n=985).

The reason for the highest occurrence of administration errors in the present study might be due to the administration of drugs by nurses under training and lack of proper monitoring by trained nursing staffs. The higher percentage of administration as compared to the prescribing errors indicates that prescribing errors were not intercepted by the nurses. In the prescription stage, the most common cause of the error was the omission of prescribing information (63.88%) in the medication order. A similar observation was also found in various studies (38-77.5%).<sup>19,20</sup> In contrast, wrong dosing schedule (39.2%) and wrong dose error (68.18%) were the most common prescribing errors in other studies.<sup>21,22</sup> The differences in the results might be due to the adoption of different classification methods for detecting prescribing errors as well as differences in the inpatients and outpatients.<sup>20,21</sup> The most commonly observed error in this category was the omission of the name of drugs, dosage form, route of administration, dose, frequency, and rate of administration in the medication order of patients. These errors of omission in prescription might be due to the busy schedule of the healthcare professionals, rush, not observing the medical cardex, dependency on the nursing cardex and information provided by nurses and not writing the full name of drugs on cardex. Similarly, other causes may be the involvement of more than one physician in the case management, frequent changes in prescription and not considering the prescription of other physicians.<sup>8</sup>

The errors of wrong dosing schedule (5.18%) were also observed and it might be due to lack of adjustment of dosing frequency in patients with renal and hepatic

impairment. The most common involved drugs for the wrong dosing schedule were Pantoprazole and Ranitidine. Similarly prescribing wrong doses (5.08%) was another important cause for the error. It might be due to the lack of updated stander guideline and dosing information. The inappropriate route of administration (5.56%) was also an important cause of medication error which was mostly associated with not changing the parenteral to the oral route on improvement of the patients' condition and as per the clinical need. Wrong dosing schedule (4.9%) was the major cause of transcribing errors. Similar observations were also reported in other studies.<sup>14,16</sup> Transcription errors can directly harm the patients causing serious outcomes. The errors at this stage can be minimized by good communication among health care professionals. Omission of administering dosages (23.9%) was the most common cause of administration error which was similar to other reports (28% to 42.1%).<sup>16,20,23</sup> In contrast to our finding, another study indicated that the most common cause was the wrong time (43%) of administration.<sup>23</sup> These differences might be due to the involvement of the nursing students for administration of drugs. Monitoring errors (7.51%) included not ordering therapeutic/safety laboratory monitoring tests either before or after the prescription of drugs. In contrast to this, another study had reported it as 3.4%.<sup>12</sup> The lower rate as compared to our study might be due to differences in the clinical practice settings and due to higher amount of patients with lower income in our study setting forcing physicians not to monitor the laboratory values. Even though the frequency of occurrence of monitoring is lower as compared to other errors, the lack of monitoring during the therapy may cause serious harm to the patient.

**Table 2: Different types of medication errors reported according to ATC (anatomical and therapeutic classification) classes of drugs (n=985).**

ATC Categories Level 1	Prescribing errors	Transcribing errors	Administration errors	Monitoring errors	Total errors (%)
<b>A-Alimentary tract and metabolism</b>	139	33	135	12	319 (32.4)
<b>B-Blood and blood forming organs</b>	9	8	10	3	30 (3.0)
<b>C-Cardiovascular system</b>	27	11	25	10	73 (7.4)
<b>D-Dermatologicals</b>	0	0	3	0	3 (0.3)
<b>G-Genitourinary system/sex hormones</b>	3	1	4	1	9 (0.9)
<b>H-Systemic hormonal preparations,</b>	11	7	16	0	34 (3.5)
<b>J-Anti-infectives for systemic use</b>	69	30	110	39	248 (25.2)
<b>L-antineoplastic and immunomodulating agent</b>	0	2	2	1	5 (0.5)
<b>M-Musculoskeletal system</b>	0	0	0	0	0 (0)
<b>N-Nervous system</b>	33	17	36	4	90 (9.1)
<b>P-Antiparasitic products, insecticides and repellents</b>	1	1	1	2	5 (0.5)
<b>R-Respiratory system</b>	66	29	65	2	162 (16.5)
<b>S-Sensory</b>	0	0	0	0	0 (0)
<b>V-Various</b>	1	0	1	0	2 (0.2)
<b>Drug name not clear</b>	1	2	2	0	5 (0.5)

**Table 3: Examples of medication errors in different stages of medication.**

Causes of errors	Examples of medication errors
<b>Prescribing stage</b>	
Wrong dose/dose not adjusted	In a patient with eGFR=31 ml/min, tablet acyclovir 200 mg orally five times a day was prescribed whereas the guidelines suggest two times a day.
Wrong dosing schedule	Tablet Etricoxib 90 mg every 12 hours was prescribed while the guidelines suggest every 24 hours or the dose should not be greater than 120 mg per day.
Duplication	Tablet Olmesartan 20 mg and tablet losartan 25 mg were prescribed and administered at same time.
<b>Transcribing stage</b>	
Wrong drug	Injection moxifloxacin 400 mg every 24 hours was prescribed but moxifloxacin was transcribed as metronidazole 400 mg every 8 hours.
Wrong dose	Tablet prazosin 2.5 mg every 24 hours was transcribed as prazosin 5 mg every 24 hours.
Wrong dose schedule	Tablet methotrexate 15 mg weekly was transcribed as tablet methotrexate 15 mg every 24 hours.
Wrong route	Tablet clonazepam 0.25 mg every 24 hours orally was transcribed as tablet clonazepam 0.25 mg every 24 hours intravenously.
Omission and duplication	Tablet spironolactone 50 mg every 12 hours was transcribed as spironolactone 50 mg every 24 hours and spironolactone 25 mg every 12 hours with different trade names and both were administered.
<b>Administration stage</b>	
Dose omission	Administration of some doses of life saving drugs like hydrocortisone, aspirin, rosuvastatin, furosemide, amlodipine, doxofylline, salbutamol, and ipratropium was also missed.
Wrong medicine	rabeprazole was administered instead of ranitidine.
Wrong dose	Tablet lorazepam was prescribed for 2mg in the morning, 2 mg in the afternoon, and 4 mg at night but the patient was administered 2mg every 8 hours.
Wrong dosing schedule	In the case of patients with renal impairment, schedules were not modified for ranitidine, domperidone, and tranexamic acid.
Wrong route	Ranitidine, pantoprazole, and omeprazole were mostly administered intravenously when the patients can take them orally.
Extra dose /duplication	Injection ketorolac 30 mg every 12 hours is not recommended for more than 5 days but the patients received drugs for 8 days.

Drugs in ATC Class A-alimentary tract and metabolism category (32.39%) were reported with the highest medication errors. Similar results were also observed in other studies (15.7-40.91%).<sup>16,20,21,24</sup> The higher percentage of errors observed in the gastrointestinal agents in our study might be due to the overuse of proton pump inhibitors and H<sub>2</sub> receptor blocker. Among the drugs for alimentary tract and metabolism, the most prescribed drug was Pantoprazole (62.2%) and was commonly involved drug in the medication error. Approximately three-fourths of the medication errors reached the patients and one-third of the errors harmed the patients indicating that the majority of errors were not intercepted. This result was consistent with another study (61.6%).<sup>14</sup> In contrast to this, a study showed that only 36.9% of errors reached the patients but did not cause harm to the patient.<sup>14</sup> These difference might be due to the higher rates of administration errors (41.6%) in our study compared to lower administration rate (18%) in another study.<sup>14</sup> Due to medication errors, the percentage of patients harmed was higher in our study as compared to another study (19%).<sup>12</sup> In contrast, another study indicated that only 1% of the patients were harmed.<sup>14</sup> The present study had some limitations. The study findings might not be generalized as it was conducted in a medical ward at a single hospital. We could not identify dispensing errors since the majority of medicines were purchased from the pharmacies outside the hospital. Prescribing based on the indications and drugs contraindicated to patients could not be identified and evaluated.

## CONCLUSION

Medication errors were associated with the majority of the hospitalized patients and were harmful to one-third of them. Prescribing and administration errors were the major source of medication errors. Omission of doses, frequency, routes of administration were the major problems that needs to be addressed. The nursing staffs should be sensitized time to time to optimize patient safety by preventing the medication errors. The prescribers also need to make aware to write the complete and clear instructions in the medication order to prevent medication errors which ultimately have a huge impact on patient safety.

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