

Pattern of potential medication errors in a tertiary care hospital in Nepal.

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Abstract

In the process of treating a patient, errors may occur at any stage of pharmacotherapy starting from the prescription writing, dispensing, administration and monitoring. The present study was conducted to identify the potential medication errors among the outpatients and to categorize them based on the onset, underlying cause, medication error index and severity of medication error. A cross-sectional study was conducted in Manipal Teaching Hospital, Pokhara, Nepal between July 2007 to October 2008. The prescriptions having medication error was photocopied and used as the data source. The encountered medication errors were classified based on their onset, underlying cause, medication error index and severity of medication errors. Altogether 66 medication errors were recorded in 59 prescriptions. Medication errors were noticed more in prescribed medication of male patients and with anti-microbial class of drugs. All (100%; n=66) the errors had latent onset. More than 2/3rd (68.18%; n=45) of errors had underlying cause as wrong dose. Similarly, more than 2/3rd (72.73%; n=48) of errors were found to be medication error index of 'Category B' which suggests an error occurred, but medication did not reach to the patients and the degree of severity of most of the medication errors (69.70%; n=46) were 'B' on severity scale means clinically significant error which can increase need for patient monitoring. Conclusively, the proper communication between pharmacists and prescribers prevented majority of potential errors which is appreciable and should be continued.

Key words: Medication Error, Nepal, Outpatients, Pharmacovigilance.

INTRODUCTION

Rational pharmacotherapy involves the appropriate use of medications for the patients to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community (World Health Organization, 1987). A medication error is defined as any preventable event that may cause or lead to inappropriate use or patient harm while the medication is in the control of healthcare professional, patient or consumer (Institute of Medicine, 2000). Pharmacotherapy is a complex process which requires the involvement of wide variety of healthcare professional including doctor, pharmacist, nurses etc. It is evident that error in the pharmacotherapy is quite common and can occur at the any stage of medication process like prescribing, dispensing, administration and monitoring (Gandhi et al., 2005, Runciman et al., 2003). Studies from Thailand and Georgia, and Colorado found

that prescription error is the most common type of medication error and accounted for 20-40% of all medication error (Sangtawesin et al, 2003, Barker et al., 2002).

A study from United States of America (USA) suggested that around 44000 to 98000 hospitalized patients die due to medication errors in USA every year and number of death due to medication error is increasing day by day. (Institute of Medicine, 2000 and Phillips et al., 1998). Similarly in Australia 2-4% of all hospital admissions and up to 30% for patients aging more than 75 years are due to medication related out of which 75% are potentially preventable (Runciman et al., 2003). Further, a study conducted in the neighboring country, India in 304 patients in public hospital found that 34% patients were having at least one medication error (Pote et al., 2007).

Nepal is a developing country with poor healthcare status with a large number of drug use problem. Some of them are irrational prescribing and dispensing, polypharmacy,

misuse of antibiotic, irrational drug promotion, adverse drug reaction, drug interaction etc (Blum, 2000). Moreover, status of hospital pharmacy is very poor and most of the hospital does not have their own hospital pharmacy. In addition, there is lack of drug information (DI) services in the most of hospital. Further more, there is lack of package insert in the pharmaceutical preparation manufactured by Nepalese pharmaceutical company which is supposed to be one of cheap source of DI in the developing country. This suggests the lack of vigilance to the medicine and high risk of medication errors. To improve the vigilance, pharmacovigilance program was recently started to monitor the drug related problem (Uppsala Report, 2007). Currently, there are five regional pharmacovigilance centers in the country. Drug Information and Pharmacovigilance Center in Manipal Teaching Hospital is one among them. The center is regional center for western region of Nepal. The center is located in Manipal Teaching Hospital which tertiary care teaching hospital in Western Nepal. The hospital also has a drugs and therapeutics committee (DTC). The committee has also taken several steps to ensure the safe use of medicines (Palaian and Mishra, 2005). In the past, there were several initiatives taken to minimize the medication error which include drug information services for healthcare providers, medication counseling to the patients, continue pharmacy education to the hospital pharmacists, triplet billing system, batch dispensing, telephonic queries to prescribers, envelope system for dispensing drugs, computer billing system, separation of inpatients from outpatients, dispensing only with prescription, dispensing by qualified pharmacists and arrangements of medicine in pharmacy (Dubey et al., 2006). After such initiative there is need to know the pattern of medication error in the hospital. Moreover, the study in this area is lacking in Nepal. The present study was conducted with the following objectives:

1. To identify the potential medication errors among the outpatient prescriptions
2. To categorize the identified medication errors based on their onset, underlying cause, medication error index and severity of the medication errors.

Material and Methods

Study type: Cross-sectional Study

Study site: The study was conducted in the Outpatient Pharmacy of Manipal Teaching Hospital. Manipal Teaching Hospital is a tertiary care teaching hospital in

Western Nepal. It is 700 bedded multidisciplinary hospital having clinical departments such as Medicine, Surgery, Pediatric, Psychiatry, Orthopedic, Obstetrics and gynecology, Ophthalmology, Dermatology, Otorhinolaryngology and Dental. On an average 600 patients visit the hospital everyday. Outpatient pharmacy is one of the units of Hospital and Clinical Pharmacy Department situated at the ground floor of the hospital.

Duration: The study was conducted during July 2007 to October 2008.

Inclusion Criteria: Prescriptions having at least one medication error were included in this study.

Source of data: Photocopy of the prescriptions was the sources of data.

Operation modality: Pharmacists working in the outpatient pharmacy department whenever encountered the error in the prescription, he/she photocopied the prescription. Further the clarification with the prescriber was done before dispensing the prescription. After clarification the correction made by the prescriber was recorded in the backside of the photocopied prescription. The photocopied prescription is studied for the categorization of error in this study. Categorization of medication error was done based on published literatures (Jackson and Reines, 2003; Allan and Barker, 1990; Hartwig *et al* 1991 and Lustig, 2000).

Result analysis: The data obtained from the prescription were entered in the Microsoft excel spread sheet and analyzed.

Results: Altogether 59 prescriptions encountering medication error were photocopied.

Demography: The demography of the patients whose prescription encountered potential medication error revealed that number patients were male (42.37%, n=25) as compared to female (28.81%, n=17), where as in 28.81% (n=17) sex was not mentioned. The Age distribution of patients encountering potential medication error shows that more number of patients was in the age group 21-30 years (18.64%, n=11), followed by age group years 11-20 (13.56%, n=8), age group 41-50 years (10.17%, n=6), age group 31-40 years (8.47%, n=5), age group 61-70 years (6.78%, n=4), age group 0-10 years (3.39%, n=2), age group 51-60 years (1.69%, n=1) and age group >70 years (1.69%, n=1). However, in 35.59% (n=21) of prescription age of the patients were not mentioned. The department wise distribution of the prescription encountering potential medication error is given in Table 1.

Table.1: Department distribution (n=59)

Department	No. of prescription	Percentage
Medicine	11	18.64
Surgery	10	16.95
Orthopedics	7	11.86
Pediatrics	7	11.86
Obstetrics and gynecology	5	8.47
Dermatology	4	6.78
Ophthalmology	3	5.08
Psychiatry	3	5.08
Dental	2	3.39
Otorhinolaryngology	2	3.39
Unknown	5	8.47

Categorization of medication errors: Altogether 169 drugs were prescribed in 59 prescriptions encountering 66 medication errors. While classifying the medication error based on onset it was found that all the error

recorded (n=66) was latent.

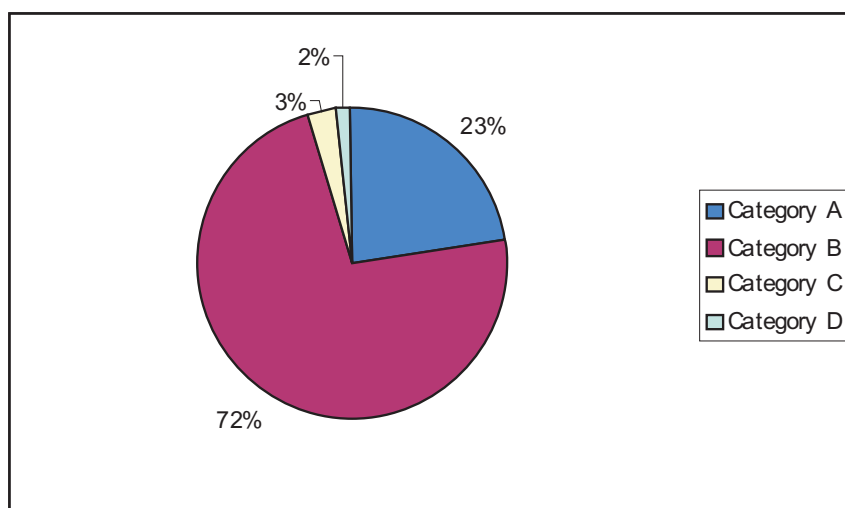
Categorization of medication error based on underlying cause: The classification of medication error based on underlying cause is shown in Table 2.

Table.2: Classification of medication error based on underlying cause (n=66)

Underlying cause	No. of Error	Percentage
Wrong dose error	45	68.18
Wrong Time error	7	10.61
Extra dose error	6	9.09
Wrong dosage form error	3	4.55
Wrong dose preparation error	3	4.55
Wrong route of administration error	1	1.52
Others	1	1.52

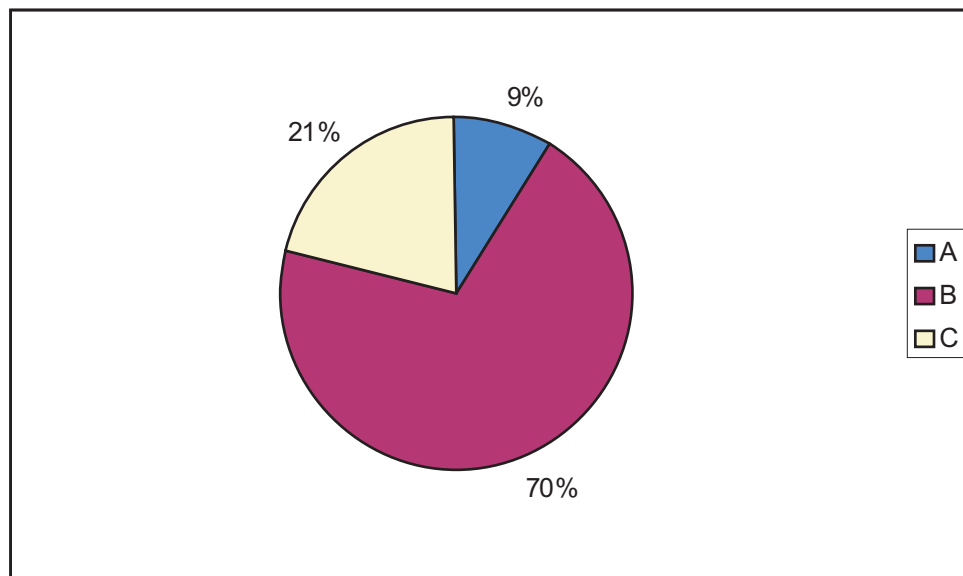
Categorization of medication error based on medication error index: The classification based on medication error index is given in Figure 1.

Fig.1: Classification based on medication error index (n=66)



Categorization of medication error based on severity: The classification based on severity is given in Figure 2.

Fig.2: Classification based on Severity Index



Classification of drugs involved in medication error: Similarly the classification of drugs which was involved in medication error is classified in Table 3.

Table.3: Class of drugs involved in medication error (n=66)

Class of drugs	Number of drugs	Percentage
Anti-microbial agents	27	40.91
Gastrointestinal agents	14	21.21
Drugs acting on central nervous system (CNS)	7	10.61
Non-steroidal anti-inflammatory drugs	5	7.58
Anti-allergic drugs	4	6.06
Corticosteroids	2	3.03
Non-opioid analgesics	2	3.03
Anticancer drugs	1	1.52
Drugs acting on cardiovascular system	1	1.52
Drugs acting on respiratory system	1	1.52
Vitamins	1	1.52
Others	1	1.52

Table.3: Site of Infection Diagnosed

Sl. No.	SITE OF INFECTION	% OF CASES	n=482
1	Gastro-intestinal	26.86	
2	Respiratory	22.39	
3	Others	50.74	

The prescriptions were also evaluated for their rationality and irrationality. Based on the number of antibiotics prescribed in each prescription 71.64% prescriptions were found to be rational, the remaining of 28.36% prescriptions were found irrational with two or three

antibiotics prescribed in each prescription. When prescriptions were evaluated based on the drug interaction 58.21% prescriptions were found to be rational and 41.79% prescriptions were irrational, the data have been represented in Table-4.

Table.4: Rationality and Irrationality of Prescriptions

Sl. No.	PATTERN	RATIONAL (%)	IRRATIONAL (%)
1	Number of antibiotics prescribed	71.64	28.36
2	Drug interaction	58.21	41.79

DISCUSSION

The inappropriate utilization of antibiotics, especially in infants and children, forced many researchers to evaluate the consumption of this class of antimicrobial agent in order to control the risk and its misuse. Studying the antimicrobial prescribing pattern in an Indian tertiary hospital has showed that two antimicrobials per prescription was maximum in pediatrics, while one antimicrobial was maximum in surgery, urology and internal medicine departments. Amikacin, ciprofloxacin, cefotaxime and cloxacillin were the most preferred drugs¹⁰. The result of present study demonstrates that antibiotics are frequently used in infants and children. In

contradict to the previous observation it was found that the most widely used antibiotics belong to class of quinolones and penicillins (Pn). Norfloxacin, ciprofloxacin, ofloxacin and amoxicillin are found to be most frequently used antibiotics in pediatrics. Resistance against quinolones such as norfloxacin, ciprofloxacin, etc. develops quite slowly and hence they are widely used¹¹. Amoxicillin is active against all organisms sensitive to Pn G, in addition it inhibits many gram negative bacilli, its oral absorption is better and is not interfered by food along with this higher and more sustained blood levels are produced¹². Amoxicillin with

Steps taken to prevent the medication errors: Majority of times (89.39%, n=59) after encountering medication error pharmacists clarified the errors with the prescribers. Whereas in few instances (7.58%, n=5) action taken after encountering the medication error are not recorded. However, in one instances (1.52%, n=1) the drugs were wrongly dispensed by the pharmacists and in one instances (1.52%, n=1) correction was done after few doses.

Example of potential medication error: Some of the potential medication errors are described in Table 4.

Table.4: Example of potential medication error

Name of drugs	Medication errors
Secnidazole	Tab Secnidazole was prescribed as 2 gm two tab HS single dose which after clarification with prescriber it was dispensed as Tab Secnidazole 1 gm two tab HS.
Cloxacillin	Cap Cloxacillin was prescribed as 500 mg three times daily for 7 days which after clarification with prescriber, it was dispensed as Cap Cloxacillin 500 mg four times daily for 7 days
Azithromycin	Tab. Azithromycin was prescribed as 500 mg four times daily for 7 day which after clarification with prescriber, it was dispensed as Tab. Azithromycin 500 mg once daily for 7 days
Tramadol	Tab. Tramadol was prescribed as 500 mg whenever necessary which after clarification with prescriber it was modified as Tab Tramadol 50 mg whenever necessary.
Ranitidine	Tab. Ranitidine was prescribed as 40 mg daily 7 day which after consultation with prescriber it was modified as Tab. Ranitidine 150 mg twice daily for 7 days.

DISCUSSION

Altogether 66 medication errors were identified in 59 prescriptions. The study found that all the medication error has latent onset. In most of the cases (68.18%) underlying cause for medication error was found to be wrong dose. Similarly, most of the medication errors were found to be medication error index of 'Category B' which suggests an error occurred, but medication did not reach to the patients. The degree of severity of most of the medication error was found to be 'B' on severity scale means clinically significant error which can increase need for patient monitoring. Medication error was found more with anti-microbial class of drugs.

There are several underlying cause involved in medication error which include wrong dosing interval, wrong dose, wrong route, wrong drug, wrong dosage form etc. We found that most promising underlying cause for medication error was wrong dose (68.18%) followed by wrong time (10.61%) and extra doses (9.09%). Similarly in a study conducted in 36 healthcare facilities in Georgia and Colorado found most frequent types of error were wrong time (43%), omission (30%), wrong dose (17%) (Barker et al., 2002). Whereas in another study conducted in India found most common types were drug interaction (68%) followed by incorrect interval (12.1%) and incorrect dose [over and under dose] (9.6%)

(Pote et al., 2007). This suggests that wrong dose and wrong timing are the common underlying cause involved in medication error.

We found that medication error was more with the anti-microbial class of drugs (40.91%) followed by GI agents (21.21%), CNS agents (10.61%). This is because anti-microbial are the class of drugs used commonly in different specialties. A study conducted in India by Pote S et al. also found anti-microbial class of drugs were more involved in medication error (Pote et al., 2007) and Similar result was found in study conducted in Israel where anti-infective class of drugs were involved in 38.7% of medication error (Lustig A, 2000). It suggests that anti-microbial class of drugs need special focus.

A study suggests that more than 75% of potential medication errors can be prevented (Runciman et al., 2003). In our study we found that more than two-third of medication error (72.73%) were found to be medication error index of 'Category B' means an error occurred, but medication did not reach to the patients which is very good from the patients point of views followed by 22.73% of 'Category A' in medication error index which suggest circumstances or events that have the capacity to cause error. Similarly in a study conducted in Thailand, 76.71% of medication errors were prevented

(Sangtawesin *et al*, 2003). This suggests that reporting medication error is not a fault finding process rather it is a preventing of its incidence. Hence, reporting of medication error should be encouraged.

More than 2/3rd of the Medication error found clinically significant error which can increase need for patient monitoring. Similarly a study conducted in Israel found that 11%, 16%, 34% and 80% of clinically significant error occurs per day in Internal Medicine, Intensive Care, Surgery and Hemato – Oncology Departments respectively (Lustig A, 2000).

Several strategies have been recommended to prevent the medication errors in the health care setting. Some of them are computerized physician order, clinical pharmacist monitoring order, improved communication between healthcare practitioners etc. In this study majority of time (89.39%) pharmacists clarify their doubt with the prescribers to prevent the medication errors. Hence, it is evidence that proper communication between healthcare professionals can prevent the majority of potential errors.

CONCLUSION

Medication error in the healthcare setting is a common phenomenon. Medication error is more common with anti-microbial class of drugs and the most common underlying cause behind medication error is wrong dose. Most of the errors are clinically significant and it can be prevented by working together in a healthcare team. We experienced that most of the medication error was mainly due to poor prescription writing. Since, we prevent most of the potential medication errors through proper communication with prescriber which is highly appreciable. But the matter should be discussed in DTC meeting to minimize the risks.

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