



A PROSPECTIVE STUDY TO EVALUATE AND ANALYZE MEDICATION ERRORS IN A TERTIARY CARE HOSPITAL

Pharmacy

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ABSTRACT

The aim of the present study was to identify the medication errors, to classify and analyze it according to NCCMERP index and PCNE categorization and to elucidate the need for constant monitoring for medication errors in the tertiary care hospital setting. **Methodology:** A prospective observational study was conducted in the inpatients of a tertiary care hospital over a period of 1 year from January 2021 to December 2021. **Results:** Out of 2968 prescriptions and 1200 cases audited, 206 medication errors were observed. Majority of errors was observed in males than in females. Prescription errors (28.64%) most frequently occurred error followed by transcription errors (27.66%). Drug-drug interactions (16.94%) and drug-food interactions (6.77%) were also detected. 7.76% of administration errors were identified along with 19.90% of documentation errors, 5.33% of dispensing errors, 18 (8.73%) of omission errors. The frequency of indenting errors was negligible (2.91%). According to NCCMERP classification of medication errors, the error severity distribution was: no error (46.60%); error, no harm (50.01%); error, harm (3.39%), error, death (0%).

Conclusion: The findings of this study concludes that prescription errors were identified as most frequently occurring medication errors with incorrect drug selection, dose related errors and drug-drug interactions being more prevalent. Majority of the errors found belongs to the Category C. The study highlights the importance of constant review of files in order to identify medication errors.

KEYWORDS

Medication errors, National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP)

INTRODUCTION

Medication errors may be 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 healthcare professional, patient, or consumer". Such errors can occur from professional practice, health care products, procedures and systems including: prescribing; order communication; product labelling, packaging and nomenclature; compounding; dispensing; distribution; administration; education monitoring; and use. They can induce considerable threat to wellbeing of patient. Incidence rates of adverse drug events amongst adults admitted to the hospital have ranged from 2 to 7 per 100 admissions. Approximately, 28% of adverse drug events (ADEs) are related to medication errors and are, therefore, judged to be preventable. The medication error increases morbidity, mortality, cost burden, and decreases the patient's confidence in the healthcare systems.

Medication errors increase cost, significantly prolongs hospital stay, and increase the risk of death almost 2-fold. Several easily identifiable factors associated with large populations of medication errors includes inadequate knowledge regarding drug therapy such as age, impaired renal function and drug allergy, need for calculation of drug dose, specialized drug formulation characteristics, and medication prescribing nomenclature. Other most common factors contributed to medication error include lack of drug information, incorrect diagnosis, drug-drug related reactions, dose miscalculations, incorrect drug administration, and lack of patient education. Of course, not all medication errors lead to morbidity or mortality, but the relatively high incidence makes it a problem still worth dealing with. The pharmacists have to assume leadership roles as researchers in patient safety. Research in patient safety combines all the traditional qualitative sciences well known to health care professionals with other health care related areas of safety; like sociology, psychology, engineering, law and others. The present study has been undertaken with the aim of finding out the incidences of medication errors in indoor patients of a tertiary care center. The purpose of the present study was to evaluate demography about medication errors, drug-drug interactions and rationality of Prescription. The fast growing rates of medication errors all over the world decides the need for starting a routine prescription auditing and patient monitoring in all the multispecialty and tertiary healthcare centers in India and it points out the need for the clinical pharmacist service to rule out such unwanted mistakes in patient care.

MATERIALS AND METHODS

Study Design

A prospective observational study was conducted in the inpatients of a tertiary care hospital over a period of 1 year from January 2021 to December 2021. Patients admitted in the hospital irrespective of the departments and diagnoses were included in the study. Study was done by referring to patients' individual case files. Data collection forms of medication administration record, doctors order sheet and drug interaction check list were utilized to collect relevant data by referring to patient case sheets. NCCMERP taxonomy was applied to analyze the frequency and types of medication errors.

Category A: Circumstances or events that have the capacity to cause an error.

Category B: An error has occurred but the error did not reach the patient.

Category C: An error has occurred that reached the patient, but did not cause harm to patient.

Category D: An error has occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm.

Category E: An error has occurred that may have contributed to or resulted in temporary harm to the patient and required intervention.

Category F: An error has occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization.

Category G: An error has occurred that may have contributed to or resulted in permanent patient harm.

Category H: An error has occurred that required intervention necessary to sustain life Category I: An error has occurred that may have contributed to or resulted in the patient's death.

Exclusion criteria: Following patients were excluded (N=917) from the study, out patients and inpatients who did not receive any drugs (N=492), discharge against medical device (N=115) and medicolegal cases (N=310).

RESULTS & DISCUSSION

This study was exclusively designed to find out the medication related errors in the tertiary care hospital were out of 2968 prescriptions audited, 206 medication errors were discovered during the study period (Table .1). Inclusion and exclusion of the cases for the study is given in Fig .1. A total of 1200 cases were analysed and majority of errors were observed in the males (n=750) than in the females (n=450) (Fig 2). Goal of the study was to identify and analyse the medication errors occurring in a tertiary care hospital. Total number of medication errors were 206 (17.16) which is comparable with a prospective observational study conducted by Nrupal Patel et al in 2016 with a

study population of 1109 patients and the total medication errors observed were 403 (36%)¹.

According to the NCCMERP classification of medication errors, the error severity distribution of this study was: no error (46.6%); error, no harm (50.01%); error, harm (3.39%) and error, death (0%) (Figure 3). Here out of 103 errors that belonged to the error ;no harm group ,84 errors did not reach the patient (Category B) .The drug duplication ,the unavailability of prescribed drugs and incorrect documentation comprised this category.84 errors was categorized as C and 13 of them were category D errors .There were 4 errors in the E category .Hypersensitivity reactions that occurred as a result of intravenous drug administration formed the major cases in this category . These results can be correlated with the study conducted by Asad E. Patanwala et al in 2009 in which a total of 178 medication errors were identified in 192 patients and 37% of patients overall had an error that reached them and no error resulted in permanent harm to the patient¹⁰ .3 errors were classified as category F which contributed to the temporary harm to the patient that required prolonged hospital stay . Daratumumab induced bradycardia, Tenepride induced acute pancreatitis, Aceclofenac induced acute kidney injury comprised of these errors.

Present study identified and reported 59 (28.64%) prescription errors (Table 2) with incorrect drug selection(30.5%) and dose related errors (20.33%)(Table 3) being more prevalent. This can be correlated with a study conducted in Saudi Arabia by Mashaal AL Shaikh et al in 2013 in which 949 medication errors were reported during the one year study period and seen predominantly in the prescribing stage (89%)² . The dose related error with the code of C3.5 that relates to dose timing instructions wrong, unclear or missing includes 8 prescription errors and 12 documentation errors . The study also was able to account for the drug over dose (3.3%) that was later on recorded by the clinical pharmacists .This is in contrast with the study conducted by Sergey Zakharov et al in 2012 which implicates that out of 82 medication errors committed by physicians where error of drug overdose was 73.2%³ . Drug- drug interactions (13.55%) and drug-food interactions (8.47%) were also detected and documented in the present study (Table 4) which complies with the study conducted by Sandip Patel et al in 2018 in which potential drug- drug interactions were observed in 95 cases out of 427 patients and serious drug interactions in 28 cases⁴.

In this study, followed by prescription errors, high incidence of medication errors was found in the transcribing stage. Out of 206 medication errors, 57 (27.66%) transcription errors were identified and reported (Table 1). This is in correspondence with the study conducted Fanak Fahimi et al in 2009 in which they reported 72.4 errors per month in Loyola University, USA⁵ . In a retrospective analysis of medication errors carried out by Sheraz Ali et al in 2017 ,they detected and reported an increased number of errors during the transcribing stage (42.28%), followed by prescription errors (27.53%). A very few number of errors occurred at the dispensing and administration stages (7.1%)⁶ . This is in conform with the findings of the present study in which large number of errors (27.66%) was found in the transcribing stage and the number of administration errors were found to be significantly less(7.76%). Present study identified 41(19.90%) documentation errors and 16 (7.76%) omission errors (Table 2). A cohort study was carried out by Bartyra Leita et al in 2016 for the evaluation of dose omission in which 1119 prescribed medications were monitored and found that 238 (21%) dispensed doses were not administered to the patients which is in contrast with the present study⁷ .

The incidence of medication administration errors was studied and found that 16 errors (7.76%) were associated with the administration of drugs (Table 2). In the present study wrong time and frequency errors (50.0%), Drug under administration (18.75%) and drug over administration (25%) were the frequently occurred administration errors (Table 3). The study conducted by Alwiena J Blignaut et al to determine the incidence of medication administration errors in the medical and surgical units of the public hospitals in the Gauteng Province of South Africa in 2017 reported a total of 296 administration errors⁸ . The study concluded that wrong time errors and omissions are more prevalent than dose related errors while in the present study dose related errors are highest. In this study the frequency of dispensing (5.33%) and indenting errors (2.91%) is negligible (Table 1) which complies with the study conducted by Kapil G Zirpe in 2020 with 0.5% dispensing error and 1.5% indenting error⁹ .

The Interventions associated with the drug related problem were also

included in our study where out of 206 medication errors, 99 of them were dealt at the prescriber level and 59 of them were dealt at the patient strata .25 of these errors were intervened at drug level where drug , dosage ,frequency and formulations were changed.3 of the side effects detected were reported with appropriate clarifications from the respective clinicians.

CONCLUSION

The present study showed an occurrence of 206 medication errors among the 2968 prescriptions analysed. The findings of this study concludes that, prescription errors were identified as most frequently occurring medication errors with incorrect drug selection, dose related errors and drug-drug interactions being more prevalent. According to NCCMERP classification of medication errors, majority of errors comes under the Category C. The study highlights the importance of constant review of files in order to identify medication errors as early as possible so as to optimize a better patient care and medication safety. It also demonstrates the need for the constant monitoring of every aspect of drug administration including the patient over the counter medication consumption which plays as important a role in preventing the occurrence of medication errors.

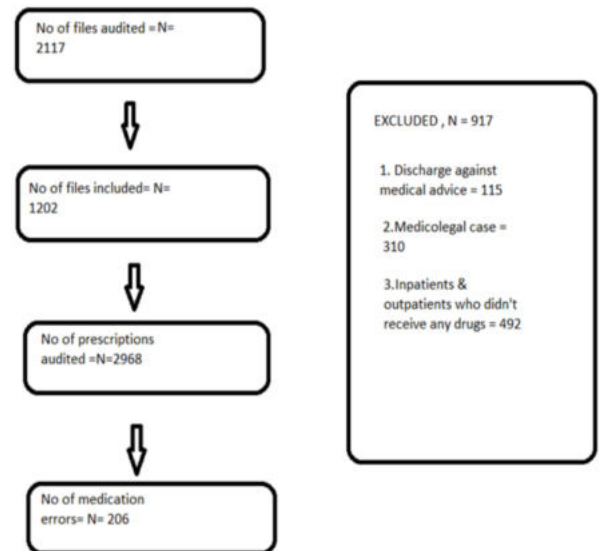


Fig 1: Inclusion and exclusion of study

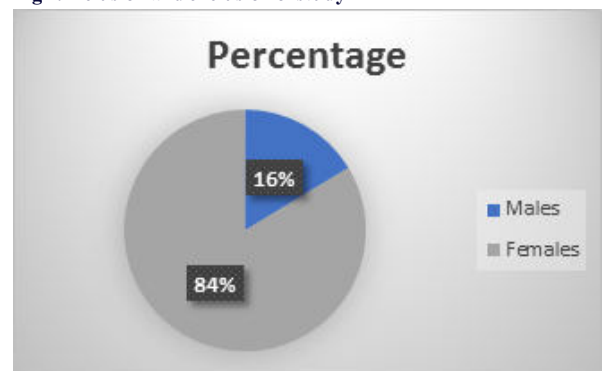


Figure 2: Age distribution

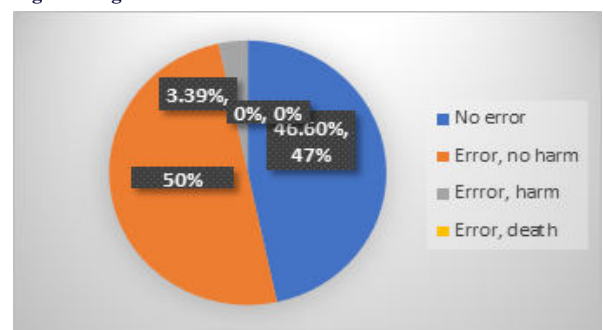


Figure 3: NCCMERP Classification of errors

Table 1: Incidence of medication errors

No of files audited	Total no prescriptions audited	Total no of errors
1200	2968	206

Table 2: Distribution of errors

SI No	Type of error	frequency (n=206)	Percentage (%)
1.	Prescription error	59	28.64
2.	Transcription error	57	27.66
3.	Administration error	16	7.76
4.	Omission error	16	7.76
5.	Documentation error	41	19.90
6.	Dispensing error	11	5.33
7.	Indenting error	6	2.91

Table 3: PCNE classification V8.01 code based causes of drug related problems

Primary Domain	Code	Cause	Frequency (n=206)	Percentage (%)	
Drug selection	C1.4	Inappropriate combination of drugs or drugs and herbalmedications	18	8.73	
	C1.5	Inappropriate duplication of therapeutic group or active ingredient	5	2.42	
	C1.6	No drug treatment in spite of existing indication	6	2.91	
	C1.7	Too many drugs prescribed for indication	3	1.45	
	Dose selection	C3.1	Drug dose too low	1	0.48
		C3.2	Drug dose too high	2	0.97
		C3.3	Dosage regimen not frequent enough	2	0.97
Drug use process	C3.4	Dosage regimen too frequent	1	0.48	
	C3.5	Dose timing instructions wrong, unclear or missing	8(P)+12(D)*	9.7	
	Dispensing	C5.1	Prescribed drug not available	5	2.42
C5.2		Necessary information not provided	4	1.94	
C5.4		Wrong drug or strength dispensed	2	0.97	
Others	C6.1	Inappropriate timing of administration and /or dosing intervals	8	3.88	
	C6.2	Drug under administered	3	1.45	
	C6.3	Drug over administered	4	1.94	
	C6.6	Drug administered via wrong route	1	0.48	
	C8.2	Other cause	29(D)+57(T)+6(I)+16(O)*	52.4	

*P-Prescription error, D-Documentation error, T-Transcription error, I-Indenting error, O-Omission error

Table 4 : Drug -Drug/Food interactions under prescription error

Domain	Frequency(n=206)	Percentage (%)
Drug -Drug interaction	8	3.88
Drug -Food interaction	5	1.45

Table.5 : PCNE classification , the planned interventions

Primary Domain	Code	Intervention	Frequency (n=206)	Percentage (%)
At prescriber level	I1.1	Prescriber informed only	51	24.7
	I1.2	Prescriber asked for information	28	13.5
	I1.3	Intervention proposed to prescriber	12	5.8
	I1.4	Intervention discussed with prescriber	7	3.3
At patient level	I2.1	Patient (drug)counselling	18	8.73
	I2.2	Written information provided(only)	5	2.42
	I2.3	Patient referred to prescriber	21	10.19
	I2.4	Spoken to family member/care giver	4	1.94
At drug level	I3.1	Drug changed	11	5.33
	I3.2	Dosage changed	6	2.91
	I3.3	Formulation changed	1	0.48
	I3.4	Instructions for use changed	7	3.39
	I3.5	Drug stopped	13	6.31
	I3.6	New drug started	9	4.36
Other interventions	I4.2	Side effect reported to authorities	3	1.45

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