A Cross-Sectional Study on Role and Impact of Clinical Pharmacist in Identifying and Investigating the Causes of Medication Errors and Strategies to Prevent them through Patient Counselling in a Tertiary Care Hospital

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Article Info

ISSN (online): 3107-393X
Volume: 02
Issue: 05
September- October 2025
Received: 04-07-2025
Accepted: 05-08-2025
Published: 03-09-2025
Page No: 01-07

Abstract
Background: The causes of medication errors can be associated to different factors and such factors include professional practices, healthcare products, procedures, communication problems (e.g., prescribing, product labelling, packaging, and nomenclature), education, monitoring and inappropriate use of medications.
Aim and objectives: The objective of the study is to determine the role and influence of a clinical pharmacist in recognizing and investigating the causes of medication errors, and putting up strategies to avoid them by counselling patients in a tertiary care hospital.
Methods: This is a prospective, observational and cross-sectional study, which was carried out in the General Medicine Department in the ESI Hospital of Indiranagar, Bangalore and over a period of 6 months. On the inclusion criteria, a total of 189 inpatients were selected based on the inclusion criteria which were that the patients had to be within the age range of 15-75 years of age and willing to participate. The patients who had acute or chronic illnesses and were reported to have made medication errors were also eligible to participate in the study.
Results: There were 189 patients of whom 147 were male and 42 were females. Antibiotics took up the second place in the sample population in terms of the percentage of medication errors (31.7), then anti-hypertensives (16.9), and anti-diabetics (15.8), with the other categories of drugs making less percentage of errors. Among 189 patients approximately 185(97.8) patients survived medication errors outcome and approximately 4(2.1) patients died because of medication error.
Conclusion: It is among the first systematic reviews of the medication errors in Karnataka. Patient safety is at risk due to medication errors, which can be prevented. The results indicate the significance of the effective strategies, such as regular monitoring and educating patients, to minimize medication-related problems and enhance patient care. Independent double-checks, persistent monitoring, and patient counselling are some of the roles that clinical pharmacists play in order to detect and deal with medication errors. Their work has a great impact on the improvement of the healthcare outcome and minimization of the medication errors development. Also, the research defines various medication errors types and their frequency, which can be used in the specific preventive programs.

DOI: https://doi.org/10.54660/IJPIS.2025.2.5.01-07

Keywords: Medication Errors, Causes of Errors, Types of Medication Errors, Prevention Strategies, Prospective Studies, Cross-Sectional Studies, Observational Studies.

Introduction

Medication errors are explained as the event that can either cause or result in improper use of medication or harm to the patient under the custody of a healthcare professional, patient or consumer. Such errors may be occasioned by a number of factors such as professional practices, healthcare products, procedures, and systems. Such areas of concern are prescribing, communicating

orders, labeling of the products, packaging, compounding, dispensing, distribution, administration, education, monitoring, and use of medicines. Drugs are essential in enhancing quality health outcomes when taken properly. The mistakes are, however, frequent and may involve prescribing mistakes, omission errors, wrong-time administration, dispensing errors, improper doses, incorrect dosage forms, errors in monitoring, transcription errors, and administration errors. These mistakes can be caused by the underlying factors, such as ineffective communication, handwriting, deficient verbal communication, inefficient drug distribution systems, stress in the workplace, inadequate design of technologies, unauthorized access to medications, incorrect medication dosage, absent complete information about their treatment, and patient confusion. As pointed out by the World Health Organization (WHO), effective medicine can only be exercised through effective drug management. The inclusion of pharmacists as part and parcel of the healthcare team is critical towards the delivery of systematic and professional support services. In tertiary healthcare facilities, medication errors are usually caused by gaps in monitoring, lack of adherence to treatment interventions, drug duplication, mis-selection of drugs, drug overdosing, mis-duration of the treatment, and medication administration mistakes. Prevention strategies are based on the approach that is multi-dimensional, i.e., the pharmacy technicians should do a thorough review of examinations, correctly record data, verify that the drugs are properly given, update patient records on time, and rectify errors in real-time retaining a clear audit trail. Also, error reporting is of great significance in the prevention. It is suggested that healthcare providers use such sources as the Medwatch program by the FDA, the National Coordination Council on Medication Error Reporting and Prevention (NCCMERP), the Institute of Safe Medication Practices (ISMP), and The Joint Commission to report and manage medication errors.

Aim and Objectives

Aim:

To evaluate the role and impact of clinical pharmacists in identifying and investigating medication errors and devising strategies to prevent them through patient counselling in a tertiary care hospital.

Objectives:

1. Early identification and investigation of the causes of medication errors.
2. Prevention of medication errors by addressing root causes.
3. Enhancing medication adherence and improving patients' quality of life through advanced patient counselling.
4. Promoting drug safety to prevent complications.
5. Providing comprehensive patient care by minimizing medication errors.

Methodology

It was a prospective, observational, and cross-sectional study that was carried out over a period of six months, in the General Medicine Division of ESI Hospital, Indiranagar, Bangalore, among patients. Patients were given patient information sheets and informed consent was taken or by those looking after the patients. The patient eligibility was based on inclusion and exclusion criteria. The research evaluated the medication errors, their extent and type, NCCMERP classification, the cause of error, the side effects of the drugs and the rate of medication errors.

Study Design

- Type: Prospective, Observational, and Cross-Sectional Study.
- Sample Size: This is around 150-180 patients.
- Period of study: 6 months, starting in October 2019.
- The site of study was in the General Medicine Department under ESI Hospital, Indiranagar.

Study Criteria

Inclusion Criteria:

- The age of patients was between 15 to 75 years.
- Inpatients who were ready to take part in the investigation.
- Patients who have recorded medication errors with acute or chronic diseases.

Exclusion Criteria:

1. Patients below 15 years, elderly above 75 years.
2. Patients and outpatients who are not willing to take part in the study.

Source of Data: Method of Data Collection: The eligible patients of the General Medicine Department were selected according to the predefined inclusion criteria. Patient case sheets and interviews were used in data collection. The data collected entailed patient demographics, medical history and treatment information.

Statistical Analysis: Descriptive and inferential statistical tools were used in the analysis of the collected data. Those findings were well tabulated and interpreted in order to respond to study objectives

Results:

Table1: Demographic details of the patient (n =189)

S No.	Demographic details	Number	Percentage (%)
1	Gender		
	Male	147	77.7%
	Female	42	22.2%
2	Family income		
	1-3 lakhs/Annum	95	50-2%
	3-5 lakhs/Annum	65	34-3%
	>5 lakhs/ Annum	29	15.3%

The demographic data of 189 patients are displayed in this table 1. Most of them were male (77.7%) with the family income ranging between 1 and 3 lakhs per annum (50.2%), which means that the predominant patient population was predominantly male with an average family income of 3 lakhs per annum.

Table 2: Percentage of mode of committed medication errors

S No.	Mode of error	Number	Percentage
1	Administering	53	28%
2	Dispensing	13	6.8%
3	Monitoring	10	5.2%
4	Prescribing	8	4.2%
5	Documentation	36	19%
6	Patient compliance error	69	36.5%

This figure 1 and table 2 classifies the errors in medication by type. The most prevalent patient compliance errors (36.5%), then administering errors (28) and documentation errors (19) resulting in the selection of these areas which are major areas where intervention can be made to minimize medication errors.

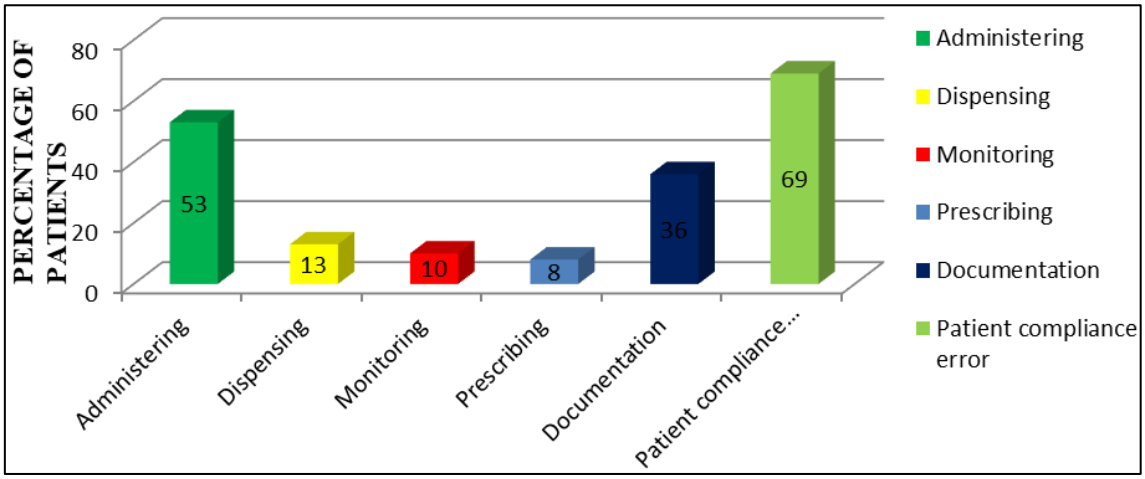

Fig 1: Percentage of mode of committed medication errors

Table :3 Category of Drugs involved in medication errors in the sample population

S No.	Drug group	Number	Percentage
1	Antibiotics	60	31.7%
2	Anti-Hypertensives	32	16.9%
3	Anti-Diabetics	30	15.8%
4	Anti-Anginal	12	6.3%
5	Anti-Arrhythmic	10	5.29%
6	CHF	23	12.1%
7	Intravenous drugs	16	8.4%
8	Others	6	3.1%

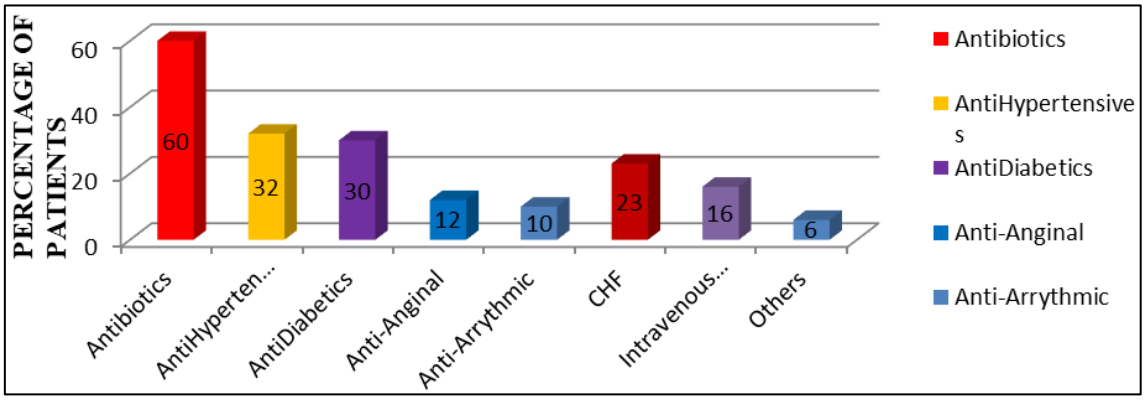

Fig 2: Category of Drugs involved in medication errors in the sample population

Table 3 and Figure 2 Medication errors in the sample population most commonly involved antibiotics (31.7%), followed by anti-hypertensives (16.9%) and anti-diabetics (15.8%), with other drug categories representing smaller percentages of errors.

Types of Medication Errors in the Sample Population

Highest number of medication error was seen in 36 patients due to prescribing error, followed by 30 patients due to Wrong time errors. Both Omission errors and Wrong dosage form errors were seen in 29(15.3) patients. About 29(15.3) improper dose errors were seen in patients. Followed by 5 Unauthorized drug errors seen in patients.

Table 4: Types of Medication errors

Type	Number	Percentage
Prescribing error	36	19%
Omission errors	29	15.3%
Wrong time errors	30	15.8%
Unauthorized drug errors	5	2.54%
Improper dose errors	23	12.1%
Wrong dosage form errors	29	15.3%
Detoriated drug errors	6	3.1%
Compliance errors	19	10%
Others	12	6.3%

Table 4: Details of drug Administration

	Medication error	Below therapeutic level (low dose)	Percentage	High dose	Percentage
Improper	Telmisartan	12	6.3%	14	7.4%
doses	Ramipril	09	4.7%	11	5.8%
	Furosemide	06	3.17%	12	6.3%
	Amoxycillin +clavulanic acid	14	7.4%	05	2.6%
	IV fluids	10	5.2%	03	1.5%
	Multivitamin drugs	03	1.5%	01	0.5%
	Cefixime	04	2.1%	08	4.2%
Wrong	Metronidazole	12	6.3%	03	1.5%
Dosage	Insulin	21	11.1%	06	3.1%
form	Metformin	15	7.9%	12	6.3%
	Amikacin	03	1.5%	01	0.5%
	Amoxycillin + clavulanic acid	18	9.5%	02	1%
	Ranitidine	13	6.8%	03	1.58%
Omission	Ranitidine	10	5.2%	07	3.7%
errors	Ramipril	03	1.5%	01	0.5%
	Furosemide	05	2.6%	01	0.5%
	Multivitamins	10	5.2%	01	0.5%

The inappropriate doses of the Telmisartan (6.3% low, 7.4% high), Ramipril (4.7% low, 5.8% high), and Furosemide (3.17% low, 6.3% high), were used. Insulin (11.1% low, 3.1% high) and Metformin (7.9% low, 6.3% high) had errors in dosage form and omission errors were recurrent with Ranitidine (5.2% low, 3.7% high) and multivitamins (5.2% low, 0.5% high).

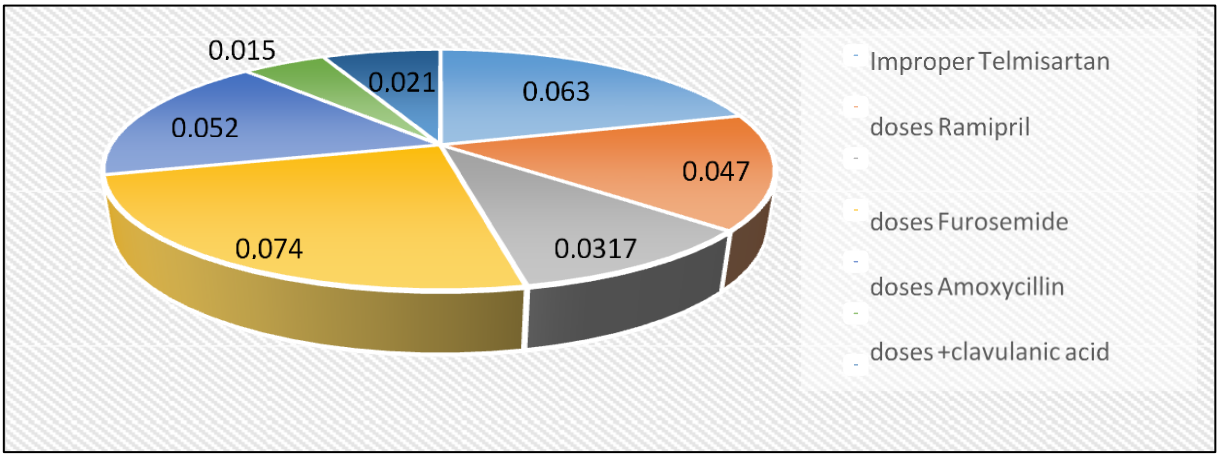

Fig 3: improper doses below therapeutic level low dose percentage (%)

Table 5: Improper dose of Medication errors with High dose

Improper doses	Medication errors	High dos with number	Percentage %
	Telmisartan	14	7.4%
	Ramipril	11	5.8%
	Furosemide	12	6.3%
	Amoxycillin + clavulanic acid	05	2.6%
	I.V fluids	03	1.5%
	Multivitamin drugs	01	0.5%

Table 6: Wrong dosage form of Medication error with low dose

Wrong dosage form	Medication error	Low does with number	Percentage%
	Cefixime	04	2.1%
	Metronidazole	12	6.3%
	Insulin	21	11.7%
	Metformin	15	7.9%
	Amikacin	03	1.5%
	Amoxycillin + clavulanic acid	18	9.5%
	Ranitidine	13	6.8%

Table 7: Wrong dosage form of medication error with High dose

Wrong dosage form	Medication error	High dose with Number	High dose with percentage %
	Cefixime	08	4.2%
	Metronidazole	03	1.5%
	Insulin	06	3.1%
	Metformin	12	6.3%
	Amikacin	01	0.5%
	Amoxycillin + clavulanic acid	02	1%
	Ranitidine	03	1.58%

Table 5, 6, 7 States that Medication errors: High error of improper dosage were present with Telmisartan (7.4) and Ramipril (5.8) and low error of wrong dosage form with Insulin (11.7) and Amoxycillin + clavulanic Acid (9.5). The omission errors were mainly Ranitidine (5.2% low dose, 3.7% high dose) and multivitamins (5.2% low dose, 0.5% high dose).

Reasons of the Error: The major causes of the error were improper handwriting (30.1), improper use of decimals (22.7), errors in calculation (19), misinformation (15.3), and careless prescribing.

Table 8: Omission error with low dose

Omission errors		Low dose with number	Percentage
	Ranitidine	10	5.2%
	Ramipril	03	1.5%
	Furosemide	05	2.6%
	Multivitamins	10	5.2%

Table 9: Omission error with higher dose and percentage

Omission errors	Medication errors	High dose with number	High dose with percentage %
	Ranitidine	07	3.7%
	Ramipril	01	0.5%
	Furosemide	01	0.5%
	Multivitamins	01	0.5%

Causes of Medication Errorsin the Sample Population

Approximately 57(30.1) patients had medication error through improper handwriting, and 43(22.7) patients had an error through improper usage of the decimal points. The error in calculation was the cause of medication error in about 36(19) patients. There was 29(15.3) patients with the medication error through the miss information and 24 patients with the medication error through careless prescribing.

Table 10: Causes of Medication errors

Causes	Number	Percentage
Calculation errors	36	19%
Improper use of decimal points	43	22.7%
Careless prescribing	24	12.6%
Missing information	29	15.3%
Improper/poor handwriting	57	30.1%

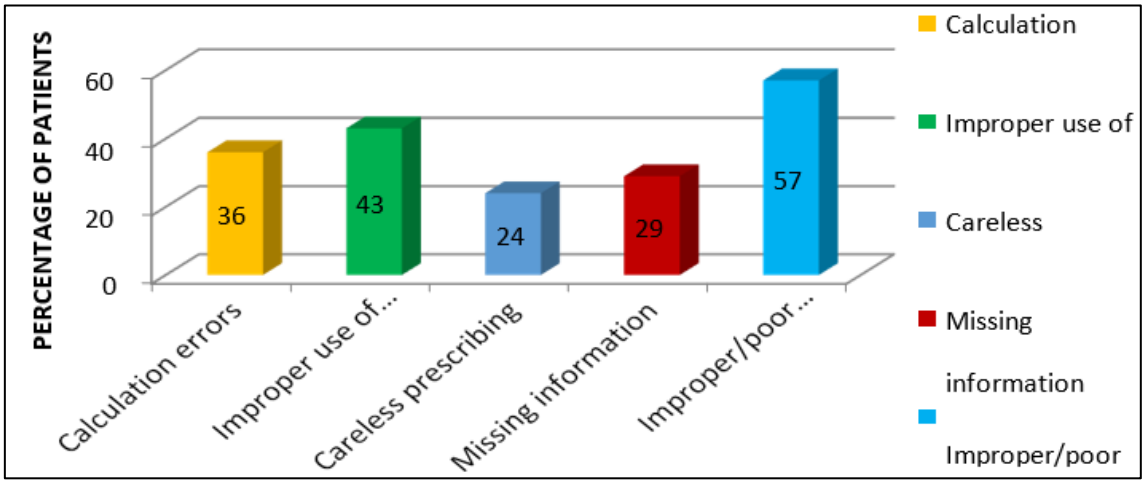

Fig 4: Patient counselingin the sample population

Out of 189 patients, about 169(89.4) patients counseling was done. And for 20(10.5) patients counseling could not be done

Table 11: Details of patient counseling

Patient counselling done	Number	Percentage
Yes	169	89.4%
No	20	10.5%

Outcome Medication Errors in the Sample Population

Out of 189 patients about 185(97.8) patients survived the medication errors outcome and about 4(2.1) patients died due to medication error

Table 12: Identification of outcome medication errors

Outcome	Number	Percentage
Survived	185	97.8%
Death	04	2.1%

Discussion

This study focuses on medication within postoperative ward at ESI Hospital where most of the medication errors were reported in the general medicine department, both male and female and then the general surgery department. Pediatrics department registered the minimum medication errors. The research was carried out in a period of six months and mostly focused on major hospital departments. Further studies should be conducted across the rest of the hospital departments to minimize the uncertainty and come up with evidence-based proposals on how healthcare providers can be involved in the practice. Excessive workload, depression, exhaustion, lack of knowledge, patient non-compliance, overtime work with insufficient resources, and lacking institutional support were identified as the major causes of the medication error. The fact that errors were not reported was associated with the fear of disciplinary measures, which showed that a non-punitive reporting climate should be established in order to promote transparency. Computerized prescribing systems, bar-coded medication systems and systematic cross-checking are some of the interventions to be used to reduce errors. Effective guidelines and training of the medical practitioners are critical in ensuring that the rate of medication errors is kept at minimal levels. The rate of error in the ESI hospital was high. Although the majority of the errors were not repeated, some were recurrent like non-availability of medications with some patients serving prolonged delays before receiving treatment. The reason is that these problems must be resolved in a collaborative effort between the doctors, nurses, and pharmacists. The groups are very important in enhancing patient safety and improved healthcare outcomes by improving quality of drug administration and monitoring practices.

Conclusion

Our research study is among the best studies in Karnataka regarding Medication errors. Medication errors are avoidable and they are detrimental to our citizens. Unless the medical profession will police itself, the public has to police the medical profession. We measured the medication errors of the medications given to the patient there by reducing the medication related problems and enhancing the care of the patient. Regular checking and regular monitoring of the patients are the major results of medication errors in order to reduce the medication errors and give goo health care. Insist on drug independent check. There have been several studies that have pointed out the role of individual pharmacists in reducing medication errors and enhancing results. We rounded out the prevalence of medication errors, and we subdivided type of medication errors. This rise in the poly medication could be attributed to a lot of factors such as multiple disease condition, older age, patient complaints or as a result of the merits of the physician and pharmacist in the hospital.

Acknowledgments

I express my sincere gratitude to the patients of ESI hospital (Indiranagar) for co-operating with us to provide information and supporting us to complete this article successfully. I express my deep gratitude to corresponding author, for taking immense efforts to guide us in the completion of article. With pleasure I extend thanks to my beloved friends for helping to complete the article.

Funding

No funding sources

Conflict of interest

None declared

Ethical approval

The study was accepted and approved by the Institutional Ethics Committee.

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