ORIGINAL ARTICLE

Evaluation and Categorization of Medication Errors Occurred in Cardiology Department of Tertiary Care Hospital

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ABSTRACT

Aim: To evaluate and categorize the medication errors occurred in Cardiology department of tertiary care hospital, Erode, Tamil Nadu to improve the treatment outcomes. **Settings and Design:** The prospective observational study was carried out in the cardiology department of tertiary care hospital. **Subjects and Methods:** The study included the patients with cardiovascular disease admitted in the hospital. A separate medication error reporting form was designed and data were collected and analyzed. **Results:** A total of 417 cases of patients with cardiovascular diseases were collected. Out of 417 cardiac cases, medication errors were found in 301 cases, which counted to a total of 516 medication errors. Incomplete prescriptions (48.83%) were the most common errors occurred in cardiac patients followed by inappropriate use of decimal (11.04%) contraindication (8.33%), omission errors (7.55%) and monitoring errors (6.20%). Physician related factors (61.43%) were responsible for most of the errors. Majority of medication errors were coming under Category A (51.88%) and Category B (35.45%), this may be due to an environment which is susceptible to medication errors. **Conclusion:** The study concluded that more than half of the patients in the cardiology department would experience medication errors. Since there is always a possibility for the occurrence of errors due to mistakes that can be easily rectified, so making necessary interventions will reduce the incidence of medication errors and thus can improve the quality of care to the patients.

Key words: Medication errors, cardiovascular diseases, patient care, clinical pharmacists

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INTRODUCTION

Medication errors are generally any barrier that prevents the right patient from receiving the right drug in the right dose at the right time through the right route of administration, at any stage in the medication use process, with or without the occurrence of adverse drug event (ADEs). It is considered as approximately, 30% of problems occurring during hospitalization are related to medication errors.[1] Moreover, it is a failure of a planned therapeutic action to be completed or the application of an inappropriate therapeutic plan to achieve a definite therapeutic aim.[2]

The NCCMERP (National coordinating council for medication error reporting and prevention) defined medication error 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. A recent report by the Institute of Medicine (IOM) estimated that the medication errors cause between 44,000-98,000 deaths each year in USA hospitals and it costs between 6-29 billion dollars to compensate for the adverse effects of such errors.[3,4] The follow-up to the IOM study 2006, showed that these errors were harming at least 1.5 million people every year. If extrapolated to Indian setup, these figures would be much higher than expected.[5]

Generally, medication errors represent the largest single cause of errors in the hospitals, which can be result from the miscommunication among physician, nurse, pharmacist, patient and other healthcare staff, which might be due to lack of knowledge, complexity of tasks involved, lack of experience, the nature of the work environment, handling of high risk drugs and also due to noncompliance of patient to be given instructions.[6]

Although medication errors occur in all departments of hospitals, cardiac patients are more vulnerable to medication errors, especially those taking anticoagulants and antiplatelet agents which are considered as high risk medicines.[1] These cardiology errors account for over 40% of medication errors[1] and continue to be the most common problem which contributes substantially to adverse events, in both hospital inpatient and outpatient settings, responsible for increased pharmacoeconomic burden.[7]

On the basis of the available studies and by examining cardiovascular patients, it is suggested that a significant degree of morbidity and mortality associated with medication errors may be preventable. According to American Heart Association (AHA) statement, about 14 to 27% of cardiac deaths due to these errors might have been avoidable[8] In Indian scenario, a proper reporting of medication errors in the hospitals is not available. 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 centres in India.[2] So it is necessary to quantify the problems associated with the medication errors in the patient setting to improve the treatment outcomes. The purpose of the present study is to evaluate and categorizing the medication errors in the cardiology department of a government hospital.

MATERIALS AND METHODS

The prospective observational study was carried out in the inpatient department of cardiology in a tertiary care hospital, Erode, Tamil Nadu, India. Institutional Ethics Committee approval was obtained before initiation of the study. The study was conducted for a period of six months. A separate medication error reporting form was designed

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for proper reporting of medication errors according to NCCMERP. Patient details, including patient case history, diagnosis, physician medication order sheets, nurse medication administration records, progress chart, laboratory investigations and report of other diagnostic tests etc., were reviewed during study period. All patients who were admitted to the cardiology department were included in the study.

DATA ANALYSIS

The patients, prescriptions and the dispensing systems were monitored for medication errors and common medication errors which occurred in our study setting were listed. The root cause analysis was carried out for such errors and they were categorized into category A, category B, Category C, category D, Category E, Category F, Category G, Category H and Category I according to NCCMERP classification depending on their severity.

RESULTS

A total of 417 prescriptions with cardiovascular diseases were collected from the hospital for a period of six months, out of which 235 (56.35%) were males and 182 (43.64%) were females. About 116 cases were excluded since it did not contain any medication errors and the medication errors were identified in 301 (72.18%) prescriptions, in which 516 medication errors were identified. Out of these, 179 (76.17%) males and 122 (67.03%) females were affected by medication errors [Figure 1].

Age wise distribution of medication errors

The demographic reports of the present study showed a higher incidence of medication errors in patients with the age group of 61-70 years 86 (28.57%) followed by 51-60 years 71 (23.58%) and 41-50 years 67 (22.25%) [Figure 2].

Types of medication errors observed in cardiac patients

Incomplete prescriptions (48.83%) were the most common errors occurred in cardiac patients followed by inappropriate use of decimal

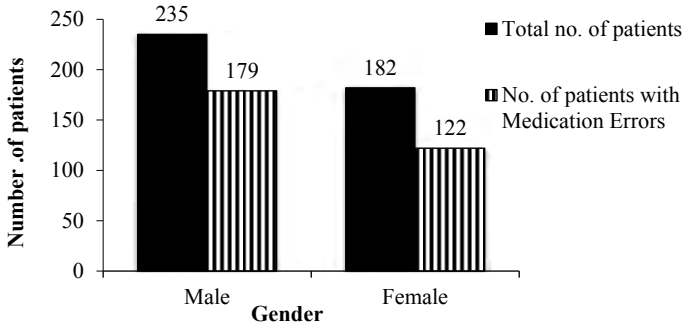

Figure 1: Number of patients with medication errors

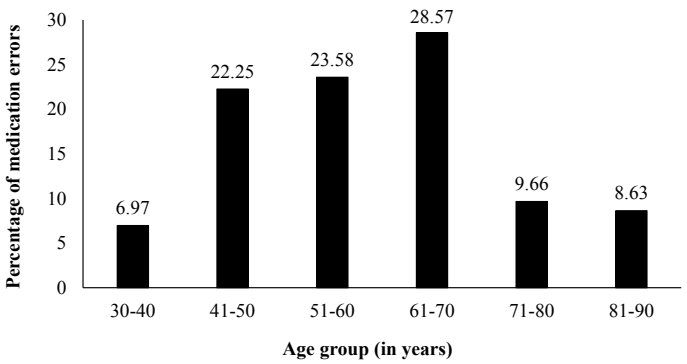

Figure 2: Age wise distribution of medication errors

57 (11.04%) contraindications 43 (8.33%), omission errors 39 (7.55%) and monitoring errors 32 (6.20%), wrong frequency 10 (1.93%) wrong dose 3 (0.58%) [Figure 3].

Number of drugs prescribed for cardiac patients with medication error

We observed that, about 119 cardiac patients are taking at least 15 drugs per day and they were more prone to medication errors (29.26%) followed by which indicated that, as the number of drugs in the prescription increases the incidence of medication errors were also increased [Figures 4-6].

Contributing factors to medication errors

From the present study, it was clear that there are multiple factors

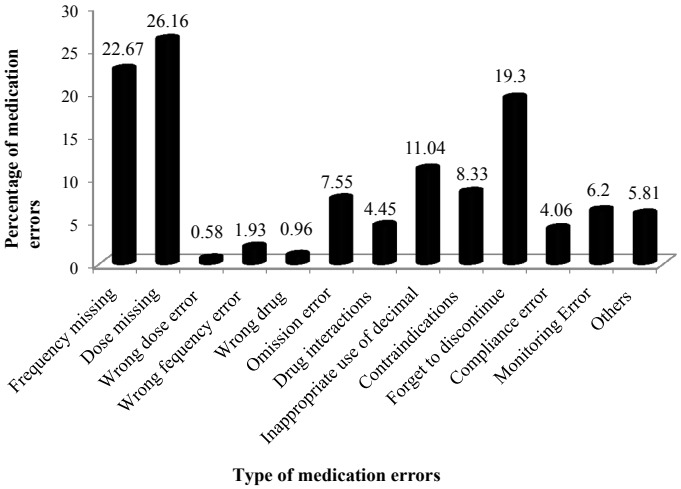

Figure 3: Types of medication errors in cardiac patients

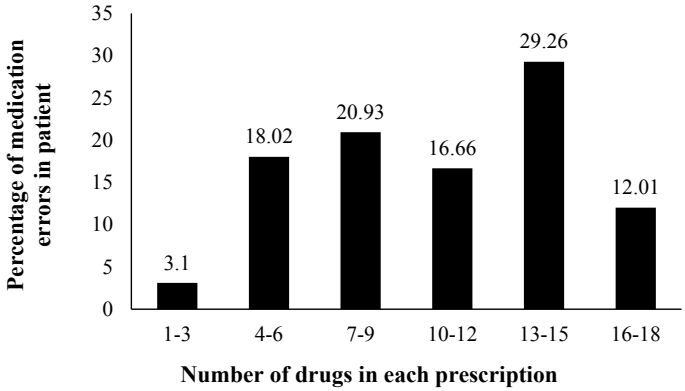

Figure 4: Number of prescribed drugs for patients with medication errors

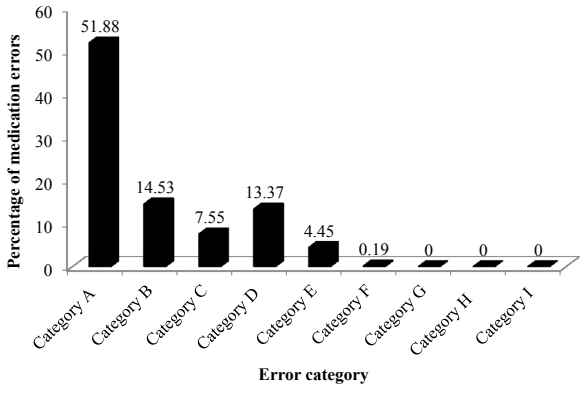

Figure 5: Severity level of medication errors

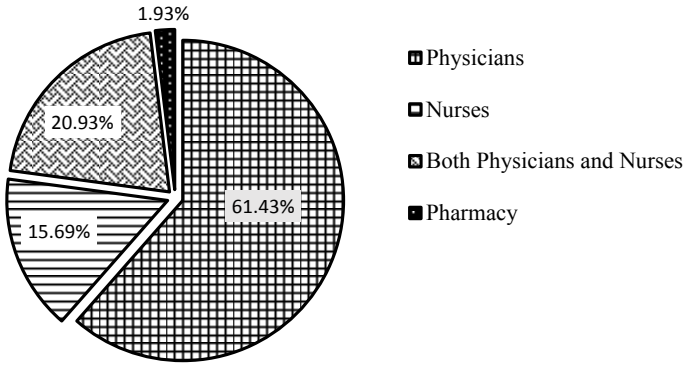

Figure 6: Professionals involved in medication errors

Table 1: Contributing factors to medication errors

S. No.	Factors leads to medication errors	No. of medication errors (%)
1	Physician Related	317 (61.43%)
2	Improper communication among physicians, nurses and patients	98 (18.99%)
3	Nurse related	91 (17.63%)
4	Short supply of medicines	10 (1.93%)

Table 2: Profession related classification of medication error

S. No.	Profession related Errors	No. of medication errors (%)
1	**Physician**	
	• Incomplete prescription	
	Dose missing	135 (26.16%)
	Frequency missing	117 (22.67%)
	• Wrong dose error	3 (0.58%)
	• Wrong frequency error	10 (1.93%)
	• Wrong drug	5 (0.96%)
	• Lack of providing patient education	50 (9.68%)
2	**Nurses**	
	• Omission error	39 (7.55%)
	• Forget to discontinue	1 (0.193%)
	• Contraindications	43 (8.33%)
	• Compliance error	21 (4.06%)
	• Lack of providing patient education	48 (9.30%)

responsible for the occurrence of medication errors like physician related factors (61.43%), improper communication among physician, nurses and patients (18.99%), nurse related factors (17.63%), short supply of medicines (1.93%). Physician related factors were responsible for most of the errors followed by improper communication between the physicians, nurses and patients, nurse related factors and short supply of medicines [Tables 1 and 2].

Severity level assessment of medication errors

No deaths or permanent disability occurred as a result of the reported Medication errors. Approximately half of the reported incidents have the capacity to cause error (51.88%) and also the study showed that, about 35.45% of errors were not reached to the patient but they require proper monitoring for confirming whether it can result patient harm. Majority of medication errors were coming under Category A and Category B followed by category D (13.37%), category C (7.55%), category E (4.45%) and category F (0.19%).

Profession related classification of medication errors

On classifying medication errors according to the professions, we found that, physician related errors (61.98%) were more as compared to nurse related errors (29.43%).

Professionals involved in medication errors

Since most of the prescriptions were incomplete and with illegible handwriting physicians were (61.43%) more responsible for the occurrence medication errors followed by both physicians and nurses (20.93%) followed by physicians (20.93%) and nurses (15.69).

DISCUSSION

Medication errors are the most common type of medical error, and cardiovascular medications prescribed to inpatients account for a large proportion of these errors. An average of one medication error occurs per hospitalized patient per day, and one quarter of all medication-related injuries are preventable.[9,10] From this study it was observed that, male patients were more affected with medication errors, which may be because of the increase in their number of prescribed drugs. This increased number of prescribed drugs may be due to associated co-morbid conditions which can be attributed to sedentary life style of male patients. Similar results obtained from a study conducted by Shrestha *et al.* reported that male patients were more commonly affected with medication errors (73%) as compared with female patients (27%)[11] and the author stated this was due to the fact that increased co morbid conditions among the male adults.

The high incident rate of medication errors was found in elderly patients (51-60 years) which can attribute to associated co-morbid conditions with ageing and also the presence of other risk factors. It may be also due to the fact that the increased number of male patients in the department during our study period. The similar findings were obtained from a study conducted by Rekha *et al.* revealed that maximum patients who were exposed to medication errors were male adults, between the age group of 50-69 years followed by 60-79 years and they stated that the contributing factors included Polypharmacy, Polymorbidity, enrolment in several disease-management programmes and fragmentation of care.[12]

Incomplete prescriptions were the most common errors occurred in cardiac patients which itself is an error, and have the capacity to cause both prescribing and administration errors. Similar results obtained from a study conducted by Shreshtha *et al.* reported that 56 (63.6%) and 45 (73.4%) were dosage related errors and errors due to illegible handwriting respectively, 8 (9.1%) and 4 (6.3%) were due to absence of route, 6 (6.8%) and 1 (1.6%) due to the absence of strength and frequency respectively.[11]

We observed that, about 119 cardiac patients are taking at least 15 drugs per day and they are more prone to medication errors (29.26%) which indicated that, as the number of drugs in the prescription increases the incidence of medication errors were also increased.

From the present study, it was clear that there are multiple factors responsible for the occurrence of medication errors like physician related factors, improper communication between physicians, nurses and patients, nurse related factors, short supply of medicines. All these professions related factors might be due to a stressful environment, distractions in work due to tiredness, illegible handwriting of the prescriber, higher work load due to heavy patient load, lack of knowledge on new drug products for both physicians and nurses, inappropriate instructions given to the patient and also patient's illiteracy.[13] The joint commission on accreditation of health care organizations (JCAHO) now requires all institutions to undertake root cause analysis of all sentinel events for the identification of factors leads to medication errors. A study conducted by Arifeulas *et al.* reported that there are multiple factors to produce medication errors, including

increased workload (49.7%), inadequate number of staff (36.5%) and burnout syndrome (25.6%)[14] and our present study findings are consistent with them.

No deaths or permanent disability occurred as a result of the reported medication errors. Approximately half of the reported incidents have the capacity to cause error (51.88%) and also the study showed that, about 35.45% of errors were not reached to the patient but they require proper monitoring for confirming whether it can result patient harm. Majority of medication errors were coming under Category A and Category B, this may be due to an environment which is susceptible to medication errors. A study conducted by Ganeshan *et al*. reported that among 69 medication errors, 8 (11.59%) errors were under the category of No error which is subcategory A, 60 (86.95%) errors were under the category error, No harm which comes under subcategory B, and they stated this was because of the carelessness of the health care professionals working in the department.[15] The present study findings were inconsistent with these results since Category A errors were more common, which may be because of the lack of prescription auditing and patient monitoring before the administration of drugs to the patients.

The study examined profession related medication errors and found that, physician related medication errors were most common which might be due to the heavy patient load to the physicians and stressful environment.

Since most of the prescriptions were incomplete and with illegible handwriting physicians were (61.43%) more responsible for the occurrence of medication errors which may be due to heavy patient load and hurry environment, high noise level in the respective wards. Poor communication among the physicians and nurses may also be the reason for these incidents. A study conducted by Balbir *et al*. reported that out of 256 medication errors most of them are due to both physicians and nurses 142 (55.46%) followed by nurses 66 (25.78%) and then physicians 48 (18.75%)[5] which was mainly due to the improper communication between the physicians and nurses during ward rounds.

CONCLUSION

The present study concluded that more than half of the patients (72.17%) attending cardiology departments would experience medication errors, but with very few life threatening events. Most of the errors were found to be under Category A (events have the capacity to cause error) and Category B (Error occurred but not reached to the patient) according to NCCMERP classification. Medication errors are multi-factorial condition, and the errors reported in this study clearly showed that there were multiple factors responsible for these medication errors including illegible hand writing, incomplete prescription, and high work load, lack of patient education and short supply of medicines. The study has highlighted the need to pay attention to prescription writing and reduce the practice of inappropriate prescribing through provision of appropriate unbiased information to healthcare professional. Since there is always a possibility for the occurrence of errors due to rectifiable mistakes done by different professionals at different circumstances, making necessary interventions can well reduce the incidence of medication errors. Clinical Pharmacists can play major role in the early detection and prevention of medication errors by regular auditing of prescriptions and educating health care professionals and patients and thus improve the quality of patient care.

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