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Short Communication

Medication errors with influencing factors of polypharmacy among elderly patients using Calcium Chanel Blockers.

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Abstract

Background: Geriatrics refers to age-related health changes and consequently causes complications in polypharmacy, generalizing prescribing patterns. The study aimed to investigate the pervasiveness of medication inaccuracies along with drug interactions.

Methodology: Out of 450 prescriptions only 210 were selected that contained Calcium Channel Blocker (CCB) and other drugs. Drug-drug interactions were articulated by Micromedex 2.0, and the harm score was determined by National Coordinating Council for Medication Error Reporting and Prevention.

Results: The outcomes revealed that 645 medication errors were identified and multiple errors were present in a single prescription. The most frequent error was unstated patient's weight (98.6%) proceeds from drug-drug interactions (66.7%). According to the harm score, 36.66% of prescriptions were placed in category D, there was a statistically significant association between the drug-drug interaction and the number of prescribed drugs ($p<0.0001$).

Conclusion: The prime solution is that the physicians should be facilitated withal trainings about drug interactions and prescription writing skills according to WHO guidelines or other recognized standards.

Keywords

Medication Error, Calcium Channel Blocker, Elderly, Hypertensive Patients, Polypharmacy.

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Introduction

Polypharmacy is an area of concern for the elderly because of several reasons. Elderly people are at a greater risk for adverse drug reactions (ADRs) because of the metabolic changes and reduced drug clearance associated with aging; this risk is furthermore exacerbated by increasing the number of drugs used[1]. Inappropriate medicine utilization is found among those aged 65 and more than sixty-five years.

Parallel research revealed the high magnitude of medication errors observed among old-age adults, and unfortunately, the reasons and involving factors were polypharmacy and, most prominently, the crumbling of care[2]. On the other hand, specific geriatric aspects have an essential role in such medication errors, including age-dependent pharmacological changes and unavailability of specific data about the safety and efficacy of medications[3].

In the elderly, multiple disease states have been prevalent for a long time, leading to polypharmacy that ultimately enhances the risk of inappropriate prescribing patterns, drug-drug interactions, adverse drug events (ADEs), and (MEs) medication errors[4]. The other causes of medication errors in elderly patients are varied and complicated, including prescribers' lack of knowledge about old age physiology, inappropriate drug prescribing, and diseases of aging[5]. Many authors supported the fact that the use of multiple medicines is highly responsible for amplifying the possibilities of drug-drug interactions and adverse drug reactions (ADRs)[6]. Drug-drug interactions were more prevalent in the prescription having five or additional drugs[7]. A previous study reported that the most commonly prescribed drug class was Calcium Channel Blockers (CCB) 37% followed by Angiotensin II receptor antagonists 21%[8].

Another study reported that diuretics were the most commonly prescribed drug, followed by CCB[9]. The percentage of polypharmacy practice in treating hypertension in primary health care centers is 52%. Associated high risk with polypharmacy includes more outpatient visits, hospitalizations, taking Potentially Inappropriate Medications (PIM), and an approximate 30% increase in medical costs as well[10].The research suggests that calcium channel blockers are a leading group of antihypertensive agents[11].

The objective of the present study was to report the medication errors in CCB prescriptions and to analyze the severity of drug-drug interaction due to polypharmacy in elderly patients in Karachi, Pakistan.

Methodology

A retrospective cross-sectional study was conducted from January to June 2019. Sample size calculation was performed using the Raosoft calculator. The calculated sample size was 377 with a 95% confidence interval and a 5% margin of error. A total of 450 prescriptions were collected from different outpatient settings in Karachi. Only those prescriptions were selected (210) that contained CCB prescribed with other drugs. Convenience sampling technique was used for data selection. Data were collected through a review of prescriptions of either sex. All ineligible prescriptions were excluded from the study.

After collecting prescriptions, they were analyzed. A complete order should contain the patient's (age, gender, weight, height) generic and brand name of the drug, medication strength in the metric system, type of dosage form, amount to be dispensed in metric units, complete vindication for use, including the route of administration, duration of therapy, dosing frequency, drug-drug interaction, medication purposes and some authorized refills if any[12]. In the present study, prescriptions were observed for drug-drug interaction using Micromedex. 2.0.[13] NCCMERP index[14] is used for categorizing medication errors into Category A-I.

The collected data were analyzed by SPSS version 20.0. Descriptive statistics consisting of percentages and frequency were calculated. However, drug-drug interactions were subjected to a chi-square test and binary logistic regression. The prescriptions were divided into two groups: prescriptions containing several drugs less than five

and those having more than or equal to five drugs. Significant association ($p<0.05$) was found between many drugs and drug-drug interactions.

In the present study, prescription orders were observed for drug-drug interactions using Micromedex and grouped into minor, moderate, and significant drug-drug interactions. In another study, the Micromedex interaction database was utilized to screen patients' medication profiles for drug-drug interactions[15]. NCCMERP index (harm score) categorizes medication errors into categories A-I.

Results

A total of 210 selected prescriptions of Calcium Channel Blocker (CCB) were included in the present study, and 645 MEs were detected. The most frequent ME was that the patient's weight was not mentioned (98.6%, n=207), followed by drug-drug interaction (66.7%, n=140) and missing diagnosis (57.62%, n=121). Ambiguous medication errors were found in (2.9%) of prescriptions. For detailed information about prescription errors, see Table 1. A total of 849 drugs were prescribed in 210 prescriptions, and the average number of drugs per prescription was 4.04.

According to the harm score (NCCMERP), maximum numbers of prescriptions (36.66%, n=77) were placed in category D, followed by category B (35.71%, n=75), and (27.62%, n=58) prescriptions were placed in most severe category I.

In the present study, statistical analysis of MEs (Medication Errors) stated that the incidence of drug-drug interactions is significantly increased with the increase in the number of drugs per prescription. In (CCB) prescriptions, there was a strong association between several drugs and drug interactions. In 210 (CCB) prescriptions majority of the drug-drug interactions (50%) were moderate, (1.42%) minor, and (9.04%) drug-drug interactions were significant. The most common pair causing DDI was amlodipine with atenolol (n=57, 27.14%).

Table 1: Medication errors and frequency of drug-drug interactions in Calcium Channel Blocker prescriptions.

Variables			n(%)
Medication Errors	Ambiguous medication order		6(2.9)
	Patient age not given		65(31.0)
	Patient weight not given		207(98.6)
	Patient sex not given		101(48.1)
	Writing wrong strength or no strength of the medicine		2(1.0)
	Omission of prescriber signature		3(1.4)
	Drug-Drug interaction		140(66.7)
	Missing diagnosis		121(57.62)
Drug Combination	Minor Drug-Drug Interactions	Aspirin + Clopidogrel	3(1.42)
	Moderate Drug-Drug Interactions	Amlodipine + Atenolol	57(27.14)
		Nifedipine + Atenolol	24(11.42)
		Captopril + Furosemide	3(1.42)
		Metoprolol + Diltiazem	3(1.42)
		Captopril + Aspirin	3(1.42)
		Enalapril maleate +Aspirin	3(1.42)
		Metoprolol + Amlodipine	6(2.85)
		Nifedipine + Metoprolol	3(1.42)
		Amlodipine + Bisoprolol	3(1.42)
	Major Drug-Drug	Clopidogrel + Nifedipine	3(1.42)

Interactions	Clopidogrel + Diltiazem	6(2.85)
	Diltiazem + Atorvastatin	3(1.42)
	Aspirin + Heparin	3(1.42)
	Diltiazem + Atenolol	4(2.00)

Discussion

Patients are managed through polypharmacy, which results in adverse outcomes that may become more severe by adding more drugs in prescription to overcome the state. The study outcomes exhibit medication errors and drug-drug interactions commonly in hypertensive patients leading to morbidity and mortality. The result of the present study is in line with other studies, which concluded that the most frequently occurring drug-related problem was drug-drug interactions due to polypharmacy. Polypharmacy is usually defined as the use of five or more drugs at a time and causes adverse effects and drug-drug interactions[16]. The present study reported a high percentage of medication errors with potential drug-drug interactions due to polypharmacy and also agreed with another study[17].

In the current study, the wrong strength of the drug was also noted. An important element, the "diagnosis" of the patient, was highly ignored, and it was found as the third most frequently contributing medication error in the present study. The previous research also reported approximately similar results related to missing diagnosis[18].

In the present study average number of drugs per prescription was 4.04, which shows that number of drugs per prescription is high. During the present study, more than eight hundred drugs were prescribed in selected prescriptions, and in the majority of the prescriptions, four drugs were prescribed, and then five and three drugs were prescribed. Drug-drug interactions were observed in the majority of the selected prescriptions. Interestingly the probability of a drug-drug interaction relatively increases with the number of medications.

Our study also highlighted a significant association between the number of drugs prescribed and drug interactions, Phi (ϕ) = 0.3. Prescriptions classified according to number of drugs were compared with drug interactions by chi-square test, which was statistically significant ($\chi 2=19.09$, $p=0.0001$). Prescriptions containing > 5 drugs increase the odds ratio, and the odds of prescriptions containing more than 5 drugs are 5.083 times greater for MEs. The findings of our study stated that as the number of drugs increases, the risk of drug interaction increases. Another similar study reported that the risk of DDIs is increased with the increase in the number of drugs[7].

The harm index demonstrates the irrational prescribing practice and medical negligence. The most frequent category was D, in which (36.66%) of prescriptions were fall, followed by category B, which included 75 (35.71%) prescriptions. In the most severe category I had (27.62%) prescriptions. Previously it was reported that 39.57% of prescriptions fell in category D, and I had 4.88% of prescriptions[19]. In the current study, minor, moderate and major drug-drug interactions of 1.42%, 50%, and 9.04% were observed, respectively. A similar study stated that the frequency of DDIs was higher in outpatient prescriptions of cardiologists due to poly-pharmacy[20]. DDI of CCB was observed with atenolol, metoprolol, bisoprolol, Clopidogrel and Atorvastatin. The logistic regression results showed that prescriptions with > 5 drugs increase the odds ratio (OR) by 5.083. Therefore, it was established that the incidence of DDIs is approximately five times more in prescriptions containing more than or equal to 5 drugs.

The situation urges monitoring the prescription-writing practices and polypharmacy trends. Consequently, patient care will be the center of attention by focusing on multi medicines and their administration. The irrational use of drugs should be controlled, and the physicians, pharmacists, and

the patient must understand that prescribing even simple drugs and antihypertensive drugs may lead to unsafe practices.

However, the present study was conducted with few constraints, like a limited sample size with one specific therapy class. However, the present study could be a breakthrough and a mile stone investigating and overcoming the false figures in prescriptions, especially among the elderly population and multiple therapies.

Conclusion

The leading root causes of prescribing errors in healthcare management for this patient population include lack of knowledge about aging physiology, geriatric pharmacotherapy, and, most importantly, overprescribing, leading to polypharmacy. All facts and figures should be addressed as a priority. The excellent solution to all these health hazards is appropriate training and supervision to monitor safe prescribing practices. It should be focused on during undergraduate medical teaching to keep them in practice for minimizing the medication errors. To control the frequency of polypharmacy, more such studies are needed to address the issue of polypharmacy and current issues in prescribing patterns.

Conflicts of Interest

The authors have declared that no competing interests exist.

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