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Research Article

SIGNIFICANT ROLE OF CLINICAL PHARMACISTS IN THE ASSESSMENT OF INAPPROPRIATE MEDICATIONS PRESCRIBED TO THE ELDERLY PATIENTS IN A UNIVERSITY TEACHING HOSPITAL

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ABSTRACT

Objective: The elderly people experience a higher incidence of diseases, physical impairment, medication use, and adverse drug effects than younger adults. The drugs should be prescribed appropriately keeping in mind that the aging process affects body's ability to handle the drugs. The present study was under taken by the clinical pharmacists of a South Indian tertiary care teaching hospital with the aim of assessing the potentially inappropriate medications (PIMs) prescribed to the elderly patients by comparing with the American Geriatric Society 2012 updated Beers criteria.

Method: During the study period of 6 months, a total of 203 patients were enrolled. The medications of these patients were compared to the Beer's Criteria to assess the inappropriate medications.

Result: The study population included 121 (59.6%) males and 82 (40.4%) female patients. The mean ages of the patients were 70 years±2.480 standard deviation (SD). The mean medication prescribed per patient was 7.08±2.480 SD. The patients had an average stay of 14.58 days in the hospital with a range of 1-3 weeks stay. There were 76 (37.4%) inappropriate prescriptions and 127 (62.6%) appropriate prescriptions as per the Beer's criteria. The common inappropriate drugs prescribed included non-steroidal anti-inflammatory drugs (20.19%), anxiolytics (13.79%), antidepressants (5.41%), antihypertensive (3.94%), antispasmodics (2.65%), anticonvulsants (1.97%), sedative and hypnotics (1.47%), antihistamines (0.98%), anti-diabetics (0.98%) and antibiotics (0.98%). Polypharmacy and the duration of hospital stay were identified as risk factors for inappropriate medication.

Conclusion: The study revealed that potentially inappropriate medications is a common problem in elderly patients, the clinical pharmacists can contribute his skill and knowledge during ward round to achieve better therapeutic outcomes in the elderly patients.

Keywords: Potentially inappropriate medications, Elderly patients, Clinical pharmacist, Beers Criteria.

INTRODUCTION

Over the previous century, there has been a dramatic rise in the number and proportion of elderly people in the developed countries. In India currently there are 68 million people aged over 60 years as this figure grows it will become highly important for the pharmacist to contribute to the rational and safe medication use in them [1]. Elderly patients often have multiple diseases and their treatment results in polypharmacy, this creates a challenge for the pharmacist to ensure that the medications are prescribed appropriately in this group by taking into consideration that the aging process affect the body's capacity to handle drugs [2]. The effects of the drug will depend on the disposition of the drug by the body and the sensitivity of the target organ to the drug. The changes in the body is due to aging effect in longer duration of action, altered drug effect and increased rate of drug toxicity and adverse drug reactions [3]. Older patients have increased risk of drug-drug interaction and often suffer inappropriate use of medication. One of the most extensively used prescribing quality indicators is a plain compilation of medications determined by expert consensus to be inappropriate for older adults commonly known as Beers criteria [4]. The criteria consist of medications that cause adverse drug reactions in elderly due to their pharmacological properties and physiologic changes of aging [5]. The present study was conducted by the clinical pharmacists with the aim of assessing the potentially inappropriate medications (PIMs) in the elderly patients by utilizing the American Geriatric Society (AGS) 2012 updated Beers criteria.

METHODS

This study was carried out in the medicine and other specialty wards of a 1000 bedded private tertiary care teaching hospital for a period of 6 months. Institutional Ethics Committee approval was obtained before commencing the study. The patients were enrolled in the study following the inclusion and exclusion criteria mentioned below.

Inclusion criteria: Elderly in-patients of all the wards above 65 years of either sex.

Exclusion criteria: Patients receiving palliative and hospital care.

A suitable data collection form was designed to collect and document the data. It included the demographic details of the patient, information regarding the disease, past medical and medication history of the patient, drug treatment chart, details of the laboratory investigations and the duration of stay. The medication details of the patients were reviewed by the study clinical pharmacist along with the attending physicians during the ward rounds on a daily basis from the day of admission to the day of discharge. The medications received by the subjects were compared with the AGS 2012 updated Beers criteria, and the PIMs were notified to the physicians. For the purpose of this study, PIMs were defined as any medication contained in the AGS 2012 updated Beers criteria. Patients were assigned as having received an inappropriate drug if they had received one or more of the medication in the Beers criteria. The inappropriate medications found were

assessed and categorized. The relationship of PIMs with the patient demographics, polypharmacy, length of hospital stay and the common disease conditions were explored. The collected data was analyzed using descriptive statistics and logistic regression test. All the data analysis was conducted using SPSS 16.0 (IBM) version.

RESULTS

A total of 203 elderly patients were enrolled during the study period. Among them, 121 (59.6%) were males, and 82 (40.4%) were females. The mean age of the patients was found to be 70 years ±2.480 standard deviation. The patients had an average stay of 14.58 days in the hospital with a range of 1-3 weeks stay.

The enrolled patients in the study suffered one major illness with co-morbidities. The common illnesses observed in the study population were hypertension (32.13%), diabetes mellitus (19.66%), asthma (11.35%) and fracture (6.92%). The other ailments include myocardial infarction, chronic obstructive pulmonary disease, parkinsonism, benign prostrate hyperplasia, urinary tract infection, anxiety, dementia, acute kidney injury, depression, rheumatoid arthritis, tuberculosis and ischemic heart disease.

Out of 203 prescriptions reviewed, there were 76 inappropriate prescriptions accounting for 37.4% of the total prescriptions and 127 (62.6%) appropriate prescriptions when compared with the AGS 2012 updated Beers criteria. The male population was found to have a higher incidence of inappropriateness of 55.26% when compared to 44.73% in females (Table 1).

The maximum number of PIMs in the prescription was found in the age group of 65-74 (Table 2) PIM was found to be high in 54 patients who received 6-10 medications followed by 15 patients who received 11-15 medications in a prescription (Table 3).

The duration of the hospital stay was found to have an association with the use of PIMs. We noticed that 66 patients, who stayed for 3 weeks, received high number of PIMs. It was observed that PIMs was not identified in patients who took hospitalization for a week period (Table 4).

The logistic regression test was applied on all the variables to assess the possibility of risk factors associated with PIM. The test results are as follows:

a. It was found that with every one unit increase in the stay, the inappropriateness is likely to increase by 2.15 times (confidence interval [CI]=1.605-2.892)
b. With every one unit increase in the number of medication, the inappropriateness is likely to increase by 1.376 times (CI=1.009 - 1.877)
c. Every asthmatic patient were at the risk of getting inappropriate medications compared to other illness by 6.217 times (CI=1.246-31.018).

Disease wise categorization was made on the enrolled patients who received the PIMs. It was noticed that 53 patients who suffered from hypertension received PIMs followed by 33 diabetic patients and 13 asthma patients. The patients who suffered other diseases received fewer PIMs. The details are presented in Table 5.

There were 18 medications that are identified as "PIM" in the study population. The drugs included alprazolam, lorazepam, oxazepam, amitriptyline, escitalopram, mirtazapine, quetiapine, hyoscine, carbamazepine, chlorpheniramine, pioglitazone, clonidine, reserpine, diltiazem, aspirin, diclofenac, zolpidem, and nitrofurantoin.

Anxiolytics were prescribed to 28 patients, accounting for 13.79% of the study population. The different types of anxiolytics prescribed included alprazolam, lorazepam, and oxazepam.

Table 1: Frequency of PIM by patient's gender

Gender	Total numbers in the study	Percentage	Number of patients received PIM	Percentage
Male	121	59.6	42	55.26
Female	82	40.4	34	44.73
Total	203	100	76	100

PIM: Potentially inappropriate medication

Table 2: Frequency of PIM by patient's age

Age (years)	Total numbers in the study	Percentage	Number of patients received PIM	Percentage
65-74	164	80.78	60	78.94
75-84	36	17.73	14	18.42
>85	3	1.47	2	2.63
Total	203	100	76	100

PIM: Potentially inappropriate medication

Table 3: Frequency of PIM by number of drugs in a prescription

Number of drugs	Total numbers in the study	Percentage	Number of patients received PIM	Percentage
0-5	71	35.6	5	6.7
6-10	116	57.1	55	72.36
11-15	15	7.4	15	20.0
16-12	1	0.5	1	1.3
Total	203	100	76	100

PIM: Potentially inappropriate medication

Table 4: Association of PIM with duration of hospital stay

Duration of hospital stay	Total numbers in the study	Percentage	Number of patients received PIM	Percentage
1 week	7	3.4	-	
2 weeks	117	57.6	10	13.15
3 weeks	79	38.9	66	86.84
Total	203	100	76	100

PIM: Potentially inappropriate medication

Antidepressants were prescribed to eight patients, accounting for 3.94% of the total population. The various types of antidepressants prescribed were amitriptyline, escitalopram and mirtazapine. Among them, amitriptyline was the most frequently prescribed, followed by escitalopram and mirtazapine.

Similarly, qutiapine an antipsychotic that was prescribed in three patients is not recommended by the criteria.

Among antispasmodics, hyoscine was prescribed in six patients accounting for 2.95% of the total population which is not recommended by the criteria.

Carbamazepine was prescribed to four patients accounting for 1.97% of the total study population. The criteria recommend using the drug with caution in the elderly patients.

Chlorpheniramine is an antihistamine drug which is not recommended by the criteria was also found to be prescribed in two patients.

Anti-hypertensives were prescribed to 8 patients that include clonidine in 4 patients, reserpine in 2 patients and diltiazem in 2 patients.

Table 5: Association of disease condition of the patients with PIMs

S. No	Disease	Total numbers in the study	Percentage	Number of patients received PIM	Percentage
1	Hypertension	116	32.13	53	35.44
2	Diabetes mellitus	71	19.66	33	20.88
3	Asthma	41	11.35	13	8.22
4	Myocardial infarction	16	4.33	9	5.69
5	Anxiety	10	2.77	8	5.06
6	Fracture	25	6.92	6	3.79
7	Chronic obstructive pulmonary disease	13	3.60	5	3.16
8	Parkinsonism	12	3.32	4	2.53
9	Dementia	7	1.93	4	2.53
10	Depression	6	1.66	4	2.53
11	Acute kidney injury	7	1.93	3	1.89
12	Ischemic heart disease	5	1.38	3	1.89
13	Tuberculosis	5	1.38	3	1.89
14	Rheumatoid arthritis	6	1.66	3	1.89
15	Benign prostrate hyperplasia	11	3.04	2	1.26
16	Urinary tract infection	10	2.77	2	1.26
Total		361		158	

PIM: Potentially inappropriate medication

Table 6: Prevalence of inappropriate drug use by drug class in the study population (n=203)

Drug class	Drugs	Number of patients with PIMs	Percentage
Anxiolytics	Alprazolam	14	6.89
28 (13.79%)	Lorazepam	6	2.95
	Oxazepam	8	3.94
Antidepressants	Amitriptyline	4	1.97
8 (3.94%)	Escitalopram	2	0.98
	Mirtazipine	2	0.98
Antipsychotics	Quetiapine	3	1.47
3 (1.47%)			
Antispasmodics	Hyoscine	6	2.95
6 (2.95%)			
Anticonvulsants	Carbamazepine	4	1.97
4 (1.97%)			
Antihistamines	Chlorpheniramine	2	0.98
2 (0.98%)			
Antidiabetics	Pioglitazone	2	0.98
2 (0.98%)			
Anti-hypertensives	Clonidine	4	1.97
8 (3.94%)	Riserpine	2	0.98
	Diltiazem	2	0.98
NSAIDs 41 (20.19%)	Aspirin	32	15.76
	Diclofenac sodium	9	4.43
Sedative-hypnotics	Zolpidem	3	1.47
3 (1.47%)			
Antibiotics 2 (0.98%)	Nitrofurantoin	2	0.98
Total number of PIMs		107	

PIMs: Potentially inappropriate medications, NSAIDs: Non-steroidal anti-inflammatory drugs

Non-steroidal anti-inflammatory drugs (NSAIDs) were prescribed in 41 patients accounting for 20.19% of the total study population. Among them 32 (15.76%) patients were on aspirin and 9 (4.43%) patients were on diclofenac. NSAIDs were used to treat fractures and rheumatoid arthritis in the study population.

Zolpidem was prescribed to three elderly patients who accounted for 1.47% of the total study population.

The details are illustrated in Table 6.

Among the study population 36 patients were prescribed one PIM accounting for 17.7% of the total study population, 28 patients were prescribed 2 PIMs accounting for 13.8% and 8 elderly patients were prescribed 3 PIMs accounting for 3.9% of the study population (Table 7).

Table 7: Frequency of patients by total number of PIMs prescribed

S. No.	Number of PIMs	Frequency	Percentage	Cumulative frequency
1	None	131	64.5	64.5
2	1	36	17.7	82.3
3	2	28	13.8	96.1
4	3	8	3.9	100
Total		203	100	-

PIMs: Potentially inappropriate medications

DISCUSSION

In our study, we have enlisted the medications that were prescribed inappropriately as per the beers criteria. The findings of the study are consistent with earlier studies on inappropriate medication in the elderly population. A study conducted by Dhall *et al.* utilized the updated beers criteria to assess the inappropriateness. The medications that include propoxyphene, digoxin, amitriptyline, diphenhydramine and hydroxyzine were found to be the PIM prescribed in their study [6]. Our study reports benzodiazepines, NSAIDs, anti-hypertensives, antidepressants and antihistamines as the commonly observed PIMs.

Benzodiazepines are more sensitive in elderly due to altered metabolisms, increased risk of cognitive impairment, delirium and falls. The Beers criteria recommend avoiding benzodiazepine for the treatment of insomnia, agitation or delirium in elderly due to its adverse effects.

Amitriptyline is highly cholinergic and sedating, it also cause orthostatic hypotension hence the criteria suggests avoiding the same in elderly persons [7].

Antipsychotics can be used with caution as they may cause adverse effects. They should be monitored closely when starting or changing dosages in older adults due to increased risk [8].

The criteria recommend hyoscine to be avoided except in short-term palliative care due to decreasing oral secretions and anticholinergic effects.

The first-generation antihistamines are lipophilic and may cross the blood brain barrier that can cause confusion, blurred vision, and

dizziness. They also have anticholinergic side effects like urinary retention and constipation [9].

Pioglitazone is not recommended by the criteria as it potentially promote fluid retention and exacerbate heart failure in elderly patients.

Antihypertensive drugs that include clonidine, reserpine and diltiazem were observed in the study. The criteria recommend that it is better to avoid clonidine and reserpine as first line antihypertensive due to high risk of central nervous system adverse effects and bradycardia.

Carbamazepine can cause hyponatremia, so the sodium levels needs to be monitored when starting or changing the dosages in the elderly patients [10].

NSAIDs were used in the management of fractures and rheumatoid arthritis in the study population. NSAID tends to cause fluid retention, exacerbate heart failure and ulcer in elderly patients [10].

Zolpidem, due to the risk of delirium, falls and fractures the criteria recommend avoiding chronic use of this drug in elderly patients [8].

CONCLUSION

The study highlights that inappropriate medication is a common problem in the elderly patients. There were 76 (37.4%) of inappropriate prescriptions and 127 (62.6%) appropriate prescriptions. During the study period, we observed 18 inappropriately prescribed medications in the elderly patients as per Beer's criteria. The study points out that the clinical pharmacist can assist the physicians during ward rounds to identify and resolve the PIMs in elderly. The involvement of clinical pharmacists in patient care in an inpatient hospital setting results in safer and more effective medication use.This initiative was appreciated and encouraged by the physicians in the hospital.

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