



A PILOT STUDY ON INAPPROPRIATE DRUG UTILIZATION IN GERIATRIC PATIENTS AT A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Prescribing to the older people is a tough job due to the chronic diseases, age related alterations in pharmacokinetics and pharmacodynamics, poly pharmacy prescribing. If more number of drugs prescribing to the patient that direct to the potentially inappropriate medications (PIMs) prescribing, medication errors, adverse drug reactions, drug interactions, inappropriate prescribing, non-adherence, increase morbidity, length of hospitalization, poor quality of life, and finally death may occur. Aim and primary objective of present study is to analyze the inappropriate drug utilization in the geriatrics population in a tertiary care teaching hospital, secondary objectives include - the drug utilization pattern, inappropriate drug use in geriatrics by Beers Criteria & PRISCUS list, usage of drugs from WHO essential drug list & National list of essential medicines (NLEM), and disease pattern among this population. In our study 46 male geriatric patients, 24 female geriatric patients were admitted. 15 PIMs observed from Beers criteria and 10 PIMs from PRISCUS list. From both the lists 5 PIMs observed as same medications. Totally in 70 patients, 46 patients were free from the PIMs, rest of the all prescriptions consists PIMs. As a consequence, Inappropriate prescribing in geriatric patients is highly prevalent. Clinical pharmacist plays a key role in appropriate prescribing to the patients by educating the clinicians regarding the therapeutic drug monitoring drug selection for appropriateness.

Key words: Geriatrics, Potentially Inappropriate Medications, Beers list, PRISCUS list, NLEM list, WHO list.

INTRODUCTION

The age 65 and above is considered as geriatrics (older people), studying on geriatrics is called gerontology^{1, 2}. The elderly population is the most rapidly increasing populations in the world. Prescribing to the older people is a challenging job. The reasons for challenging is that - chronic diseases, leading to the poly pharmacy prescribing. If more number of drugs prescribing to the patient that lead to the potentially inappropriate medications (PIMs) prescribing, medication errors, adverse drug reactions, drug interactions, inappropriate prescribing (over utilization, under utilization) or suboptimal prescribing, non-adherence, increase morbidity, length of hospitalization, poor quality of life, and finally death may occur.

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Another principal thing is pharmacokinetics and pharmacodynamic changes. It causes to changes in the GI absorption, hepatic blood flow reduction, body fat increases, fat soluble drugs undergo slower elimination, impairment of renal function^{3, 4, 5, 6, 7, 8}. Basically, clinicians do not have evidences of the benefits and risks of the drug therapy, why because older people are excluded from clinical trials due to some barriers include: co-morbidity, cognitive impairment, difficulty in attending for monitoring and finally ethical issues⁹. Long term medical care ultimately leads to the inappropriate prescribing¹⁰. Inappropriate prescribing means failure to providing the quality medical care to the patients and it is achieved by the good clinical practice. Some tools developed (Beers criteria and PRISCUS list) to identify the inappropriate prescribing in older people. Beers criteria developed by Americans, categorized inappropriate medications into three classes: first one as potentially inappropriate medications and classes to be avoiding in older adults, second one as potentially inappropriate

medications and classes to avoid in older adults with certain diseases and syndromes that can exacerbated by the drugs, and third one as medications to be used with caution. Another tool is PRISCUS list developed in Germany. By using these two tools one can minimize prescribing of potentially inappropriate medications in geriatric patients. In India there are no such tools to identify the PIMs^{1, 11, 12}. Drug utilization research is defined by world health organization (WHO) in 1977 as “study of marketing, distribution, prescription, and use of drugs in society, with special emphasis on the resulting medical, social, and economic consequences”. Drug utilization studies useful to look into different aspects of the drug use and prescribing and it is useful to know the clinical and economic effectiveness of pharmacotherapy, monitoring of drug use, controlling of drug use as well as cost and effects on the budget either on national or hospital^{13, 14}. The present study was designed to assess the inappropriate use of medications in geriatric patients by Beers criteria and PRISCUS list, drug utilization pattern in geriatric patients, the usage of drugs from WHO essential drug list & National list of essential medicines, the disease prevalence among this population.

MATERIALS AND METHOD

Methodology

Study design: Prospective observational study

Study site: Department of general medicine, SVRRGGH, Tirupati, A.P, India.

Study duration: 3 months (January 2015 – March 2015)

Study population: 70 patients

Study materials:

- Patient data collection proforma
- Informed consent form (ICF)
- Beers list
- PRISCUS list
- WHO list
- National list of essential medicines of India (NLEM)

Study criteria: -

Inclusion criteria:

- Patients of either gender who are above 65 years of age in general medicine in-patient ward with or without co-morbidities.

Exclusion criteria:

- Seriously ill patients admitted in general medicine & patients unable to communicate.
- Patients unwilling to participate in the study.

Method of data collection

This prospective study was carried out after institutional review board of Sri Padmavathi School of Pharmacy approval. All elderly patients (≥ 65 years) admitted between January to March 2015 in the general medicine in-patient ward of SVRRGGH, were included in the study. A specially designed proforma was used for collecting data which includes patient demographics, past medical history, family and surgical history, co-morbidities, diagnosis and present medications prescribed for each patient. The data was obtained by direct patient interview and from patient case profiles according to study criteria during the study period. All the prescriptions which contain different drugs were included in the study. All the prescriptions were analyzed for the use of inappropriate drugs using American Geriatric Society (AGS) Beers criteria, 2012 and PRISCUS list. Percentage of drug use was calculated according to WHO and NLEM list of India.

STATISTICAL ANALYSIS

The statistical analysis was done by using the excel software package 2007. The data was subjected to descriptive analysis using Microsoft excel. Data in Microsoft excel includes - patient inpatient number, disease name, potentially inappropriate medications from Beers list, PRISCUS list and essential drugs from WHO, NLEM India.

RESULTS

Total 70 geriatric patients were admitted in the general medicine ward during this study period; in which male patients were 46 (65.7%) and female patients were 24 (34.3%)(fig.1) and average age of the geriatric patients was 70 years. The demographic data shows that the majority of geriatric patients were in the age group of 65 -75 years, followed by age group of 75-85 years 13 (18.6%) patients and 1 (1.4%) patient in the age group of >85 years(fig.2). Among 70 patients, co-morbidities were observed in 45 patients (64.3%), single morbidity in 25 patients (35.7%) (fig.3). The most prevalent diseases observed among geriatrics were Cerebrovascular accident (CVA), Anemia, Diabetes Mellitus (DM), lower respiratory tract infections (LRTI), Anasarca, Hemiplegia, Chronic liver disease (CLD), Hypertension (HTN), Chronic kidney disease (CKD), Fever with thrombocytopenia respectively

(fig.4). In our study the total drugs prescribed were 778. Of which most frequently used drugs were Pantoprazole (62-7.96%), Paracetamol (43-5.52%), Optineuron (40-5.14%), Ceftriaxone (39-5%), Furosemide (30-3.85%), B-Complex (32-4.41%), Amlodipine (24-3.08%), Iron Folic Acid (2.95%), Atorvastatin (21-2.69%), Aspirin (19-2.44%) and the pharmacological distribution of drugs were given in below (fig.5 & table.1). Average number of medications per prescription was 11 and prescriptions with poly pharmacy were 66. Different formulations used and observed include solid dosage forms (336-43.2%), parenterals (311-39.97%), nebulizations (26-3.34%), and syrups (20-2.57%) (fig.6). Out of 778 prescribed medications, 302 medications were prescribed in brand names and 476 medications in generic names (fig.7).

Percentage of drugs prescribed from NLEM and WHO was 85% and 66% respectively (fig.8). 15 medications from Beers criteria (observed in 22 prescriptions) and 10 medications from PRISCUS list (observed in 11 prescriptions) were identified as potentially inappropriate medications and 5 PIMs commonly present in both Beers and PRISCUS list (fig.9). We know that Beers criteria PIMs divided into three categories as class 1 (Potentially inappropriate medications to avoid in older adults), class 2 (potentially inappropriate medications to avoid in older adults with certain diseases and syndromes that can exacerbate) and class 3 (medications to be used with caution in older adults), the list of PIMs was showed below (Table.2&3). Total 70 prescriptions, 46 prescriptions were free from PIMs.

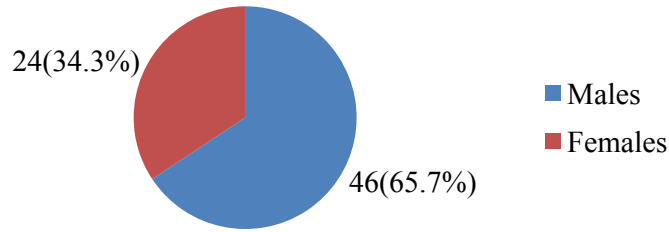


Fig.1. Gender wise distribution

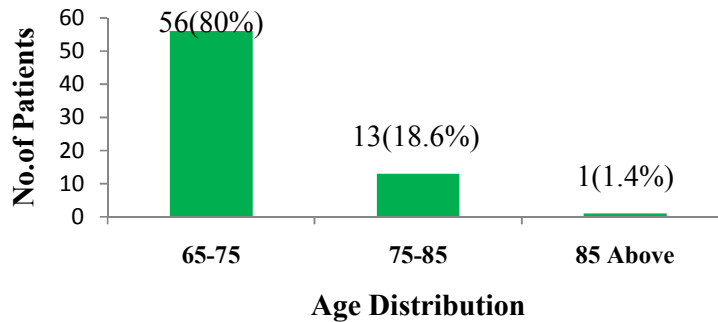


Fig.2. Age wise distribution

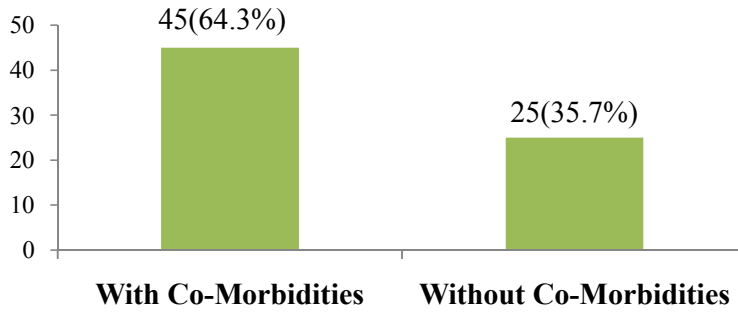


Fig.3. Co-Morbidities

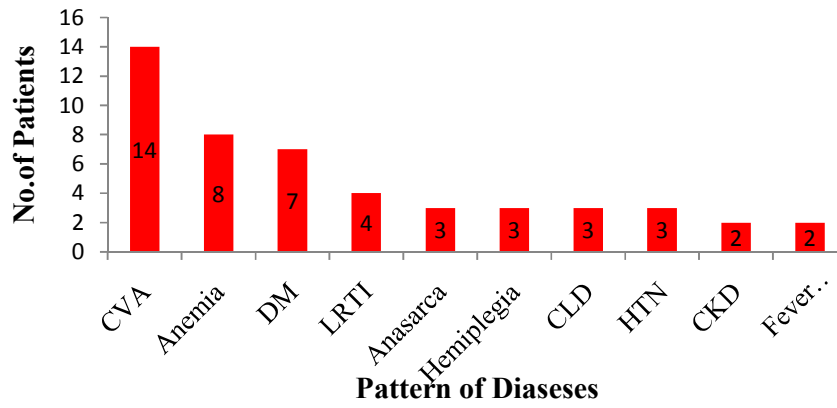


Fig.4. Pattern of Diseases

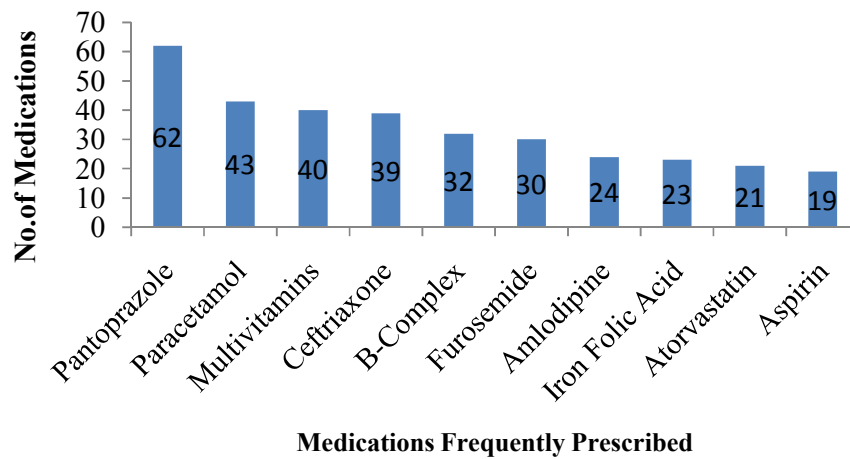


Fig.5. Frequently Prescribed Medications

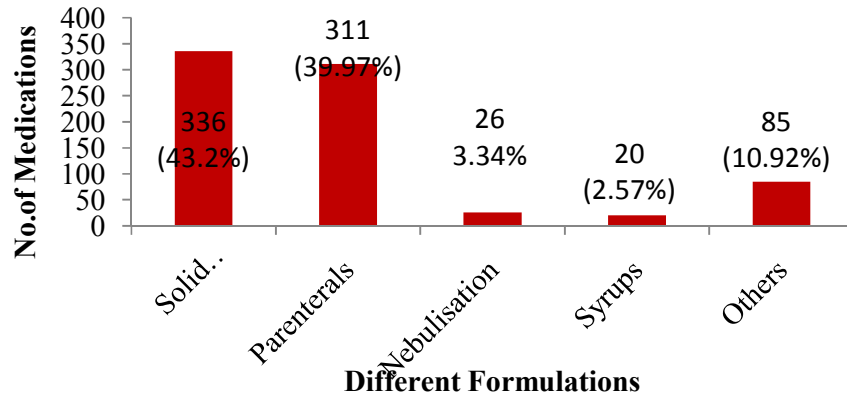


Fig.6. Formulations Used

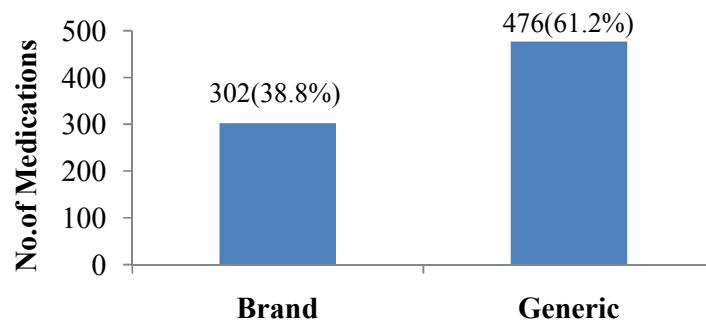


Fig.7. Brands Vs Generic

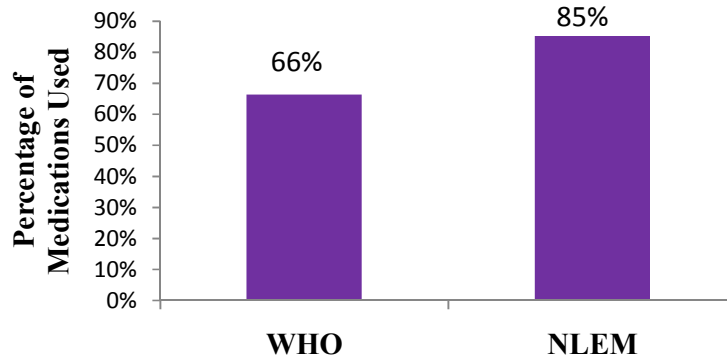


Fig.8. Medications used from WHO and NLEM

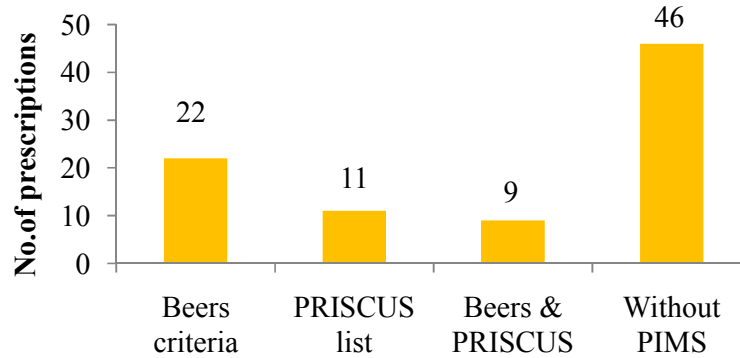


Fig.9. Prescriptions with PIMs

Table.1: Pharmacological distribution of drugs

S.No	Drug Classification	Drugs	No. of Drugs Prescribed
1.	Diuretics	Furesomide, Spironolactone, Mannitol	53(6.81%)
2.	Anti Hypertensive Drugs	Amlodipine, Atenolol, Nifedipine, Losartan, Telmisartan, Metoprolol, Enalapril	42 (5.3%)
3.	Anti Diabetic Drugs	Insulin, Metformin, Glimepiride, Glibenclamide	22 (2.82%)
4.	Anti Platelet Drugs	Aspirin, Clopidogrel	31 (3.98%)
5.	Hypolipidemic Drug	Atorvastatin	21 (2.69%)
6.	NSAIDS	Paracetamol, Diclofenac, Ibuprofen	46 (5.91%)
7.	Bronchodilators	Salbutamol, Ipratropium Bromide, Theophylline, Montelukast	54 (6.94%)
8.	Anticholinergic Drugs	Atropine, Hyoscine	3(0.3%)
9.	Anti Parkinsonism Drugs	Trihexyphenidyl, Levodopa+Cabidopa, Phenytoin, Carbamazapine	8 (1.02%)
10.	Antiulcers & Antacids	Pantoprazole, Ranitidine, Aluminium Hydroxide, Sucralfate	67 (8.61%)
11.	Antibacterial Drugs	Amoxicillin+Clavulanic Acid, Vancomycin, Metronidazole, Ampicillin, Amoxicillin, Ciprofloxacin, Azithromycin, Cefotaxime, Amikacin, Framycetin, Piperacillin+Tozabactam	97 (12.46%)
12.	Anti Fungal	Fluconazole, Ampotericin B, Itraconazole	7 (0.89%)
13.	Corticosteroids	Dexamethasone, Prednisolone, Budesonide, Methyl Prednisolone, Hydrocortisone	14 (1.79%)
14.	Multivitamins, minerals & nutritional supplements	Vitamin A, Vitamin B Complex, Vitamin C, Vitamin D, vitamin K Calcium, Iron Folic Acid, Potassium Chloride, 25% Dextrose, 5% Dextrose	112 (14.39%)
15.	Anti Emetic Drugs	Ondansetron	11 (1.41%)
16.	IV Fluids	DNS, RL, NS	52 (6.6%)
17.	Antiepileptic Drugs	Gabapentin, Phenytoin, Diazepam, Clonazepam	8 (1.02%)
18.	Others	Permethrin, Tramadol, Artisunate, Bisacodyl, Propranolol, Cetrizine, Baclofen, Lactulose, Octreotide, Albendazole, Acyclovir, Levothyroxine, Pregabaline, Amiodarone, Sorbitrate, Betahistine, Promethazine etc..	130 (16.70%)
TOTAL			778 100%

Table.2: PIMs observed in Prescriptions

S.NO	Beers Criteria	PRISCUS List	Common drugs in both
1.	Promethazine	Digoxin	Nifedipine
2.	Hyoscine	Amitriptyline	Amitriptyline
3.	Amiodarone	Nifedipine	Olanzapine
4.	Nifedipine	Olanzapine	Chlordiazepoxide
5.	Spironolactone	Paraffin	Diazepam
6.	Amitriptyline	Chlordiazepoxide	
7.	Chlordiazepoxide	Diazepam	
8.	Diazepam	Pentoxifylline	
9.	Metoclopramide	Piracetam	
10.	Diclofenac	Baclofen	
11.	Ibuprofen		
12.	Clonazepam		
13.	Olanzapine		
14.	Trihexyphenidyl		
15.	Carbamazepine		

Table.3: Class of PIMs according to Beers criteria

Class	Observed drugs
Class 1: PIMs to avoid in older adults	Promethazine, Trihexyphenidyl, Hyoscine, Amiodarone, Nifedipine, Spironolactone, Amitriptyline, Chlordiazepoxide, Diazepam, Metoclopramide, Diclofenac, Ibuprofen, Clonazepam, Olanzapine
Class 2: PIMs to avoid in older adults with certain diseases and syndromes that can exacerbate	Trihexyphenidyl
Class 3: PIMs to be used with caution in older adults	Carbamazepine, Amitriptyline

DISCUSSION

The present study evaluated potentially inappropriate medications in in-patient geriatric patients. In our study male geriatric patients (46, 65.7%) were admitted more than female geriatric patients (24, 34.3%). Out of 70 patients, 24 patients prescribed with potentially inappropriate medications of which 15 PIMs were observed from Beers criteria and 10 from PRISCUS list. From both lists 5 PIMs observed as common medications. In our study progression, inappropriateness observed in frequently in prescriptions. This proves that potentially inappropriate prescriptions were highly prevalent in geriatrics. Use of inappropriate medications is associated with increased risk of ADRs, morbidity, mortality and economic burden to the patient¹¹. We observed PIM Trihexyphenidyl, in a patient with UTI, Parkinsonism and Hemiplegia. According to the Beers criteria class 2, Trihexyphenidyl should not prescribed to the UTI patients as it produces drug-disease interaction¹. In our study we observed that almost all prescriptions were with polypharmacy. Prescription with polypharmacy may have chances to get drug-interactions, drug-diseases interaction finally that

leads to increased risk of adverse drug reactions, increased length of hospital stay, economic burden to the patient, morbidity and mortality⁷. In total 778 medications 476 (62%) medications were prescribed by their generic names which fall short of WHO recommendations of 100%. Very few studies have been conducting focusing on this aspect of drug prescribing. These findings clearly indicate that there is a need to encourage prescribing by generic names particularly in teaching hospitals. The percentage of drugs from the NLEM list was 85%, which indicated that usage of essential drugs from national list was more. However, there is a need to change the system of prescribing drugs regarding the geriatric patients. Separate geriatric clinics setup may reduce the inappropriate prescribing along with that computer based system or scheme needed to reduce the number of medications. India needs a separate list of potentially inappropriate medications as for the other countries¹¹.

CONCLUSION

Inappropriate prescribing in geriatric patients is highly prevalent. Polypharmacy is also high and usually unavoidable in elderly. Before prescribing, physician should evaluate the

medication with the suitable criteria for improving the patient safety. However, framing of such lists and criteria is need for appropriate prescribing to geriatric patients in India. For dose selection, appropriate prescribing to patient, the clinicians should relay and take assistance of clinical pharmacist while prescribing to geriatrics to avoid consequences of PIMs.

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