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Original Article

Incidence of Polypharmacy and Drug related problems among Geriatric patients in a Multispecialty hospital

T.Tamilselvan*, T.Kumutha, M.K.N.Priyanka, Reeba Bose, S. Shabana S and M. Sindhuja

Department of Pharmacy Practice, Swamy Vivekanandha College of Pharmacy, Elayampalayam, Thiruchengode, India

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ABSTRACT: The study objectives were to assess the incidence of polypharmacy and drug-related problems among geriatric patients. This prospective, observational study was conducted in 150 geriatric patients at Vivekanandha medical care hospital. The severities of adverse drug reactions were assessed using Naranjo scale and inappropriate medications were examined using BEER's criteria. The highest frequency of geriatric patients with polypharmacy was from the age group of 65-70 years (65%). Most of the patients (43%) were taking 5-10 drugs. Out of 150 patients, 124(83%) patients had comorbidities and 26(17%) patients were found without comorbidity. The percentage of patients suffering from DM and HTN were found to be the highest. Antihypertensive was mostly prescribed. The major incidence of drug-drug interaction was found in the moderate category (59.50%). DRP's were assessed. The incidence of 119 drug duplications was found in 62 cases. Inappropriate prescription of drugs was found in 61 cases (101 medications). A total of 34 ADRs were found in 34 cases. From 83 case sheets, 91 medication errors were identified. The incidence of drug related problems was highest in the general medicine department. The incidence of polypharmacy and drug-related problems were high in geriatric population of general medicine department. Benzodiazepine class of drugs was the commonly prescribed inappropriate medication as per the BEER's criteria. The incidence of probable ADR was highly observed in this study.

† Corresponding author at:

Dr. T. Tamilselvan, Professor, Department of Pharmacy Practice, Cherran's College of Pharmacy, 521-Siruvani Main Road, Coimbatore-39, India

E-mail: tamilrx@gmail.com

INTRODUCTION

Polypharmacy is a common problem and a necessity in the geriatric population. The populations above 65 years of age (geriatrics) are prone to numerous comorbid conditions which pave the way to the requirement for more medications. Polypharmacy is defined by the World Health Organization as "the administration of many drugs at the same time or the administration of an excessive number of drugs" [1]. Administration of 2 to 4 medications as "minor polypharmacy". The use of ≥ 5 medications as "major polypharmacy". The contributory factors in polypharmacy are factors related to patients like Age, Gender, Race/Ethnicity, Socioeconomic status, Clinical conditions, Medical therapy,

Behavior and factors related to physicians like Premises, Medical guidelines, Prescribing habits, Behavior [2].

A Drug-Related Problem is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes. The common drug-related problems are adverse drug reactions, medication errors, drug-drug interactions, potentially inappropriate medications and drug duplications [3]. Potentially inappropriate medication use can be evaluated by using BEER's criteria. The American Geriatric Society BEER's criteria mainly discussed about, medications to be avoided in older adults, medications to avoid in older adults having specific diseases and syndromes and medications to be used with caution in geriatric population [4].

Even though the usage of drugs cannot be stopped, the incidence of harmful drug-related problems can be minimized by focusing on safer drug therapy. A proper monitoring and prescription analysis by the clinical pharmacist is required to reduce problems related to polypharmacy. The aim and objective of the study were to find out the incidence of polypharmacy and assess the drug-related problems among geriatric patients in a multispecialty hospital.

MATERIALS AND METHODS

Study design and period

It was a Prospective, Observational study carried out for a period of six months from January 2017 to June 2017.

Study area

The study was conducted in General medicine, Cardiology, Neurology, Urology and Orthopaedics and Surgery departments at Vivekanandha Medical Care Hospital, has more than 300 beds.

Study subjects

150 Patients (inpatients) were included in our study with age group of more than 65 years, patients who are taking more than 5 drugs and minimum 3 days of hospital admission. The exclusion criteria consist of, Patients who are taking other systems of medications (Ayurvedic, homeopathic medications), Patients who are unconscious and admitted in the ICU.

Data collection and analysis

The patient details were collected and entered in Designed Data entry form. The data was analyzed for DRPs such as ADRs, DDIs, PIMs, Drug duplications and Medication Errors. The Severity of ADRs was assessed using Naranjo causality assessment scale. Potentially Inappropriate Medications (PIMs) were identified using BEER's criteria. Medication errors and drug duplications were assessed by direct observation and analysis of prescriptions. Drug-Drug interactions were checked with the help of database MICROMEDEX.com. The collected data was analyzed using Microsoft Excel software and the results were expressed in terms of percentage.

RESULTS

Gender wise distribution

In this prospective observational study, out of 354 cases collected, we identified 150 incident cases of polypharmacy. Out of total study population, 88(59%) patients were male and 62(41%) patients were female.

Age wise distribution

Out of 150 patients, 98 (65%) patients belonged to the 65-70 years category. 36 (24%) patients belonged to 71-80 years category and 16 (11%) were above 80 years of age.

Percentage of drugs prescribed

Out of 150 patients, 64(43%) patients were taking 5-10 drugs, 54(36%) patients consumed 11-15 drugs and 32(21%) patients were taking >15 drugs. Most of the patients were taking 5-10 drugs.

Number of patients with and without comorbidities

Out of 150 patients, 124 (83%) patients had comorbidities and 26 (17%) patients were found without comorbidity

Comorbidities in the study population

Out of 150 study population, 34 (19%) patients were found to have HTN, 28 (15%) patients had DM, 45(25%) patients had both HTN and DM, 23(13%) patients suffered from CVA, 30(16%) patients had CAD and 22(12%) patients belonged to others category (CKD and COPD). The percentage of patients suffering from DM and HTN were found to be the highest.

Department wise distribution of patients

Out of 5 departments, 86 (57%) patients were from the General medicine department, 36 (24%) patients were from the Cardiology department, 21 (14%) patients in the Orthopaedics and surgery department, 2 (1.5%) patients from Neurology department and 5 (3.5%) patients from the Urology department. Majority of the cases were incident in the general medicine department (57%).

Common classes of drugs prescribed in the study population

The common drugs prescribed to the Geriatric patients in the hospitals were: 15.50% of Antihypertensives, 14.50% of Antibiotics, 14% of Anti-ulcer agents, 10.60% of Anti-platelets, 8.70% of NSAIDs, 8.60% of Vitamins and Minerals, 7.10% of Anticoagulants, 6.80% of Antiemetics, 5.10% of Anti-diabetics, 4.90% of Benzodiazepines and 4.30% of Antihyperlipidemics. Majority of the drugs prescribed were Antihypertensives.

DRUG-RELATED PROBLEMS

Incidence of drug-drug interactions

From the total cases collected, 127 cases had shown the evidence of possible drug-drug interactions and 23 cases were found without any drug-drug interactions.

Category of drug-drug interactions in the prescriptions

Drug-drug interactions were found in 137 cases and the cases were classified as major, moderate and minor. Out of the total interactions, 22 (16.80%) interactions were found to be major, 78 (59.50%) interactions were moderate and 31 (23.70%) interactions were minor. The major incidence of drug-drug interaction was found in the moderate category (59.50%). And the least interactions were found in the major category (16.80%).

Major drug-drug interactions

In the prescriptions of the study population, 10 pairs of drugs causing major interactions were identified (17%). Ondansetron and Tramadol (effect- serotonin syndrome) were prescribed mostly in the Orthopedics department.

Table 1: Major Drug-Drug Interactions

Interacting medications		Effects
Ondansetron	Tramadol	Reduce the effect of tramadol; increase the risk of serotonin syndrome
Dalteparin	Clopidogrel	Increase the risk of bleeding
Aspirin	Dalteparin	Increase the risk of bleeding
Diclofenac	Dalteparin	Increase the risk of bleeding
Moxifloxacin	Hydrocortisone	Increase the risk of tendinitis and tendon rupture
Ondansetron	Fentanyl	Increase the risk of serotonin syndrome
Olanzapine	Lorazepam	Causes low blood pressure, shallow breathing
Furosemide	Amikacin	Increase the effect of amikacin; cause damage to kidney
Ondansetron	Moxifloxacin	Increase the risk of an irregular heart rhythm
Aspirin	Warfarin	Increase the risk of bleeding

Drug duplications in the study population

Out of 150 cases, 62 cases had an incidence of drug duplications. 88 cases were found without drug duplications.

Table 2: List of Drug Duplications

Therapeutic category	Examples	
Blood modifiers (Max-2)	Aspirin + Clopidogrel Prasugrel	
	Low Molecular Weight Heparin.	
Dopaminergic agents (Max-1)	Amantadine Carbidopa +Levodopa	
	Amikacin	
Anti-infective (Max-3)	Cefotaxime Doxycycline Metronidazole	
	Anti-dopaminergic antiemetic (Max-1)	Metoclopramide Prochlorperazine
	Beta-lactam antibiotics (Max-1)	Ceftriaxone Cefuroxime

Potentially inappropriate medications (PIM's) in the prescriptions as per BEER's criteria

Potentially inappropriate medications were identified as per BEER's criteria. Total 61 cases with the inappropriate prescription of drugs were found and 89 cases were found without inappropriate medications.

Table 3: List of Inappropriate Medications as Per BEER's Criteria (n = 150)

Drugs	Number of prescriptions	Percentage (%)
Alprazolam	22	21.80
Promethazine	20	19.80
Pentazocine	17	16.82
Chlorpheniramine	10	9.90
Zolpidem	8	7.92
Diclofenac	8	7.92
Ibuprofen	4	3.96
Pethidine	4	3.96
Lorazepam	4	3.96
Metoclopramide	4	3.96

Adverse drug reactions (suspected) in the study population

Adverse effects were calculated according to Naranjo's causality assessment scale and three categories of ADR were assessed (Definite, Probable and Possible). Out of 150 cases, adverse effects were found in 34 cases. 112 patients were free of adverse effects.

Table 4: Adverse Drug Reactions According to Naranjo Causality Assessment Scale.

Name of drug	Suspected reaction	Score
Furosemide	Hypokalaemia	9 (definite)
Ceftriaxone	Eosinophilia, Diarrhoea	9 (definite)
Amlodipine	Edema	8 (probable)
Alprazolam	Drowsiness	8 (probable)
Cefuroxime	Diarrhoea, Vomiting	7 (probable)
Glyceril trinitrate	Headache, hypotension	7 (probable)
Amikacin	Headache	4 (possible)
Atorvastatin	Muscle spasm	4 (possible)
Clopidogrel	Chest pain, Headache	4 (possible)
Moxifloxacin	Nausea, Dizziness	4 (possible)

Medication errors in the study population

Medication errors were assessed by monitoring case sheets and through patient counseling. Out of 150 cases, 83 patient case sheets had medication errors (prescription/transcription/dispensing/administration). A total of 91 medication errors were identified from 83 case sheets.

DEPARTMENTS AND DRUG RELATED PROBLEMS.

DRPs (ADRs, DDIs, PIMs, Drug duplications and medication errors) were assessed in 5 departments. The incidence of the drug-related problem was high in the General medicine department. Neurology department had the least incidence of cases and drug-related problems (Table 6).

Comparison between hospital stay and drug intake

The length of hospital stay was divided into 3 categories (3-5 days, 6-9days and >10days). Polypharmacy was classified into 3 groups (5-10 drugs, 11-15 drugs, and >15 drugs). Majority of the study population (28.60%) stayed in the hospital for 3-5 days and took 5-10 drugs.

Table 5: Category of medication error and examples

Types of errors	Number of errors	Percentage (%)	Examples	Identified errors
Prescription Errors	17	18.70	T. Gudcef (cefepodoxime) 250mg was prescribed by the physician.	Tab. Gudcef 200mg is the available dose.
Transcription Errors	21	23.05	Tab. Amset (amlodipine) was prescribed by the physician.	Tab. Emeset (ondansetron) was written by nurse.
Dispensing Error	31	34.07	Inj. Ampicilin 500mg was prescribed.	Inj. Amoxicillin 500 mg was dispensed by the pharmacist.
Administration Error	22	24.18	Inj. Ceftriaxone 2g was prescribed	Inj. Ceftriaxone 1g only administered by nurse.

Table 6: Departments and Drug related problems

DEPARTMENTS	DRUG-RELATED PROBLEMS				
	ADRs	DDIs	PIMs	DDs	MEs
GENERAL MEDICINE	21(61.80%)	59 (45 %)	44 (43.60%)	58 (48.70%)	36 (40%)
CARDIOLOGY	9 (26.40%)	38 (29 %)	28 (27.70%)	34 (28.60%)	27 (30%)
NEUROLOGY	0 (0%)	2 (1.50%)	1 (1%)	0 (0%)	1 (2%)
UROLOGY	0 (0%)	9 (6.90%)	7 (6.90%)	0 (0%)	5 (6 %)
ORTHOPAEDICS AND SURGERY	4 (11.80%)	23(17.60%)	21 (20.80%)	27 (22.70%)	22 (22%)
TOTAL	34	131	101	119	91

ADR – adverse drug reaction, DDI - drug-drug interaction, PIM - potentially inappropriate medication, DD - drug duplication, ME - medication errors.

Comparison between comorbidity and polypharmacy

Polypharmacy was classified into 3 groups (5-10 drugs, 11-15 drugs, and >15 drugs). Majority of the study population with comorbidity were taking 5-10 drugs. The least percentage of polypharmacy falls into the category of > 15 drugs. Drug intake was high in patients with comorbidity in each class when compared with patients without comorbidity.

Comparison between age and polypharmacy

Polypharmacy and age were divided into 3 groups. Most of the patients were in the 65-70 years category and took 5-10 drugs. Patients taking >15 drugs were less compared to other categories and patients > 80 years were the least incident.

DISCUSSION

Polypharmacy is a common problem and a necessity in the geriatric population. The population above 65 years of age (geriatrics) who are prone to numerous comorbid conditions paves the way to the requirement for more medications. Even though the usage of drugs cannot be stopped, the incidence of harmful drug-related problems can be minimized by focusing on safer drug therapy. A proper monitoring and prescription analysis by a clinical pharmacist is required to reduce problems related to polypharmacy.

In this prospective, observational study incidence of polypharmacy was seen in 150 patients over a study period of 6 months from January 2017- June 2017. The polypharmacy was seen in 59% of males and 41% of females. A study conducted by Praveen K.D *et al* resulted in 69.30% of polypharmacy in males

[5]. A study conducted by Fita Rahmawati *et al* in Indonesia found 66% of polypharmacy was incident in females [6].

In this study, about 65% of patients were in the age group of 65-70 years, 24% were in the age group of 71-80 years and 11% were in the age group of ≥81 years. The most incident of polypharmacy was observed in the age group of 65-70 years. A study conducted by Kartik Janardan Salweet *et al* showed highest incidence of polypharmacy was in 65-74 years of age group which is similar to the result shown in our study [7].

In our study about 5-10 drugs per day was prescribed in 43% patients, 11-15 drugs per day were prescribed in 36% patients and ≥15 drugs per day was prescribed in 21% patients. A study conducted by Atmaram Pawaret *et al* in Pune found 45% patients received 11-15 drugs per day which is almost similar to our study [8].

A study conducted by Shalini *et al*, the most commonly prescribed medications on a chronic basis in elderly patients were anti-hypertensives (26.13%) [9]. In our study also the most commonly prescribed drug in elderly patients were antihypertensives 15.4%.

In our study, 41% of prescriptions contain inappropriate medications. A study conducted by Praveen K.D *et al* 38% of prescriptions is inappropriate [5]. The most commonly prescribed potentially inappropriate medication in our study was Alprazolam 21.80% and Promethazine 19.80%.

A study conducted by Kartik Janardan Salweet *et al*, the most common Potential inappropriate medicine used was Alprazolam 25% followed by Aspirin 14.58% [7].

In this study 131, drug-drug interactions were found from 137 prescriptions and out of the total interactions, 22(16.80%) interactions were found to be major, 78(59.50%) interactions were moderate and 31(23.70%) interactions were minor. A study conducted by John *et al* a total of 117 prescriptions were found to have drug interactions. Among that 20.10% were minor, 66.20% were moderate and 13.63 % were severe interactions [10]. In our study 34 (22.70%) prescriptions contains ad *et al*verse drug reactions. Furosemide and Ceftriaxone have the high incidence of reaction. A study by Bilal Ahmed *et al* a hospital-based prospective cohort study, the incidence of ADRs with polypharmacy was found to be 10.50%. The highest incidence was found for antitussives and anti-dopaminergic drugs [11].

A study conducted by K.V. Ramanath *et al* shows that 4.30% of the medical chart errors were observed only in inpatients [12]. In this study out of 150 prescriptions 83 contains medication errors such as prescribing, transcribing, dispensing and administration errors.

The duration of treatment varies with the severity of the disease. Our results show that 6% of patients who were taking > 15 drugs stayed 3-5 days in the hospital, 11.30% stayed 6-9 days and 2.60% stayed >10 days. A study conducted by Kartik Janardan Salwe *et al* observed a positive correlation between the number of days stayed in the hospital with an increase in the number of drugs. Increased one day stay by an elderly lead to an increase in the number of drugs by 0.296 in admitted elderly [8].

CONCLUSION

The incidence of polypharmacy and drug-related problems were high in geriatric population of general medicine department. Benzodiazepine class of drugs were the commonly prescribed inappropriate medication as per the BEER's criteria. The incidence of probable ADR was highly observed in this study.

The medication regimen can be simplified by eliminating pharmacological duplication, decreasing dosing frequency and medication error and by regular review of drug regimen with the help of clinical pharmacy services.

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