



A Study on Polytherapy & Drug interactions in Geriatric patients in a Tertiary Care Hospital

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Abstract

Background

Polytherapy is common among elderly population as they are more prone to multiple diseases. These results in increased risk of drug interactions (DIs) further leading to increased incidence of adverse effects. Hence this study was conducted to know the incidence of Polytherapy and its drug interactions in the geriatric patients.

Methods

This is an observational study conducted

among the geriatric patients after obtaining permission from Scientific & Institutional ethics committee, Government Medical College & General Hospital, Ongole. 60 patients >65 years attending General medicine Out Patient Department during October 2021-February 2022 whose prescriptions having three or more drugs were taken for the study. Information regarding Age, Sex, Diagnosis and prescribed medications were collected. Data obtained was spread

on MS-EXCEL 2019 and results interpreted in tables and charts.

Results

66.7% belongs to 65-70 years & 33.3% aged above 70 years. 55% were males & 45% were females. The most common condition observed is Type 2 Diabetes Mellitus (Type 2 DM) with Hypertension (HT) (41.7%) followed by Respiratory Tract Infections (RTIs) (33.3%). Five drugs were prescribed for 33.3% & nine drugs for 1.7% of patients. The most common drug prescribed was Proton Pump Inhibitors (PPIs) & Antacids (15.4%) followed by Vitamin B supplements (12%) & Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (12%), Antibiotics & Antifungals (11.2%), Antihypertensives (8.1%), Anti-diabetics (7.7%) & drugs for Coronary Artery Disease (CAD) (5.4%) and Antihistaminic (5%). A total of 13 Drug Interactions (21.6%) were observed out of which 10% seen with PPI.

Conclusion

Polytherapy in Geriatric patients causes DIs, Adverse Drug Reactions (ADRs) and poor compliance, which may increase number of hospital visits and economic burden on patients. So, Prescribers should take utmost care when prescribing for multiple diseases in Geriatric patients to avoid drug interactions & adverse drug reactions.

Keywords

Polytherapy, Geriatric, Drug Interactions, Multiple diseases, Adverse effects,

Introduction

Geriatric patients (≥ 65 years of age) represent the fastest growing demographic segment in society with significant implications on the consumption of health care resources. Due to the increased life expectancy, the population of older ones is expected to

increase to about 23 crores by 2036 from 10 crores in 2011 leading to an increase in their share to the total population from 8.4 to 15.0 percent¹⁻³.

Polytherapy is common among elderly population as they are more prone to multiple diseases due to aging such as hypertension, diabetes, Alzheimer's disease, Parkinson's disease, vascular dementia, stroke, osteoarthritis, osteoporosis, fractures, respiratory, cardiovascular and kidney diseases. Nowadays, Polytherapy has also been used to describe the use of inappropriate medications/more medications than clinically indicated, and the prevalence of inappropriate medication use in the elderly ranges from 11.5% to 62.5%².

Polytherapy results in increased risk of Drug Interactions (DIs) further leading to increased incidence of adverse effects. Hence DIs are one of the commonest causes of Adverse Drug Reactions (ADRs) especially in the elderly due to polytherapy⁴. Accordingly, polytherapy and their DIs are crucial in the therapeutic choice of complex geriatric patients' regimen as they can cause ADR which may lead to decrease or increase in the clinical efficacy⁵.

The negative effects of polytherapy in elderly patients include ADRs, increased risk of hospitalization, emergency visits and death⁶. Also, the number of drugs taken is a predictive factor of poor adherence to treatment and an increase in the use of resources and services of health-care with consequent negative impact on the costs of care and assistance⁷. Geriatric patients with mild cognitive impairment or dementia who live alone often forget to take their drugs. If the caregiver is employed, he or she cannot be with his or her care recipient constantly and check if he or she is taking all the medications daily^{8,9,15}.

Therefore, prescribing in the elderly patient should be appropriate since the elderly would develop ADRs with a probability seven times greater compared to young^{7,16}. Hence this study was conducted to know the incidence of Polytherapy and its drug interactions in the geriatric patients.

Materials & Methods

This is an observational study conducted among the geriatric patients after obtaining permission from Scientific & Institutional ethics committee, Government Medical College & General Hospital, Ongole. 60 patients ≥ 65 years attending General medicine Out Patient Department during October 2021-February 2022 whose prescriptions having three or more drugs were taken for the study. Patients less than 65 years of age and prescriptions with less than 3 medications were excluded from the study. Information regarding Age, Sex, Diagnosis and prescribed medications were collected and checked for Drug Interactions.

Statistical Analysis

Data collected was entered in Microsoft Excel version 2019. Data is expressed in percentages, bar diagrams, pie charts & tables.

Results

66.7% belongs to 65-70 years & 33.3% above 70 years (Fig: 1). 55% were males & 45% were females (Fig: 2). The most common condition observed is Type 2 Diabetes Mellitus (Type 2 DM) with Hypertension (HT) (41.7%) followed by Respiratory Tract Infections

(RTIs) (33.3%) (Fig: 3). Five drugs were prescribed for 33.3% followed by four drugs (30%), six drugs (11.6%), seven drugs (10%), eight drugs (3.3%) & nine drugs for 1.7% of patients (Fig: 4).

The drug group which was prescribed the maximum among geriatric patients was Proton Pump Inhibitors (PPIs) & Antacids (15.4%) followed by Vitamin B supplements (12%) & Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (12%), Antibiotics & Antifungals (11.2%), Antihypertensives (8.1%), Anti-diabetics (7.7%), Drugs for CAD (5.4%), Antihistaminic (5%), Drugs for cough (4.6%), Calcium & Vitamin D (4.2%), Vitamin C (3.5%) & Antiemetics (1.5%) (Fig: 5).

A total of 8 FDCs (Fixed Drug Combinations) were observed in this study. Montelukast + Levocetirizine (21%) was found to be highly prescribed FDC followed by Glimepiride 2 + Metformin 500 & Cefixime 200 + Ofloxacin 200 (18%) & Amoxicillin + Clavulanic acid (12%) (Fig: 6).

A total of 13 DIs^{17,19-21} including pharmacokinetic & pharmacodynamic type of interactions were observed in this study which accounts for 21.6% of patients out of which 10% have drug interactions with PPI. (Table: 1).

Table 1: List of Drug Interactions

S.NO.	DRUGS	EFFECTS	MECHANISM
1	Metformin + Furosemide	Furosemide compete with metformin excretion & increase its toxicity (both are eliminated by common renal tubular transport systems) ¹⁹	Pharmacokinetic - Excretion
2	Aspirin + SU (Glimepiride)	Aspirin displace the SUs from binding proteins → transient rise in concentration of free drug (precipitate hypoglycaemia) ¹⁹	Pharmacokinetic - Protein binding effects
3	Furosemide + SU (Glimepiride)	Hyperglycaemia (Furosemide suppress insulin release & decrease SU action) ¹⁹	Pharmacodynamic effect
4	NSAIDs (Aceclofenac) + Furosemide	Blunted diuretic response → attenuate hypotensive action of Furosemide by retaining salt & water ²¹	Pharmacodynamic effect
5	Clopidogrel + PPI(Omeprazole, Pantoprazole)	Cyp2c19 inhibition by PPIs may reduce conversion of clopidogrel to the active metabolite → lower efficacy of clopidogrel ¹⁹	Pharmacokinetic - Metabolism: Enzyme inhibition
6	Antacid + Aspirin	Antacids alkalinize the urine → increase aspirin clearance & reduce steady state concentrations ¹⁹	Pharmacokinetic - Excretion
7	Tramadol + Pregabalin	Both can cause CNS depression leading to serious side effects like respiratory distress, coma & even death ¹⁷	Pharmacodynamic effect
8	Chlorpheniramine + Cetirizine	Increased side effects ²⁰	Additive effect
9	Chlorpheniramine + Levocetirizine	Increased side effects ²⁰	Additive effect
10	Sucralfate + FQ (Ofloxacin)	Sucralfate interferes with absorption of FQs by forming a viscous layer in the stomach ¹⁹	Pharmacokinetic - Absorption
11	PPI + Iron salt	PPI reduces gastric acidity & decreases absorption of iron salts ²¹	Pharmacokinetic - Absorption
12	Nifedipine + Metformin	Nifedipine compete with excretion of metformin & increase its toxicity (both are eliminated by common renal tubular transport systems) ¹⁹	Pharmacokinetic - Excretion
13	Azoles (Fluconazole) + Omeprazole	Azoles interact with hepatic CYPs & elevate plasma concentration of Omeprazole ¹⁹	Pharmacokinetic - Metabolism

SU – Sulfonyl Urea; NSAID – Non-Steroidal Anti-Inflammatory Drug; CNS – Central Nervous System; FQ - Fluoroquinolone

Figure 1: Age Wise Distribution

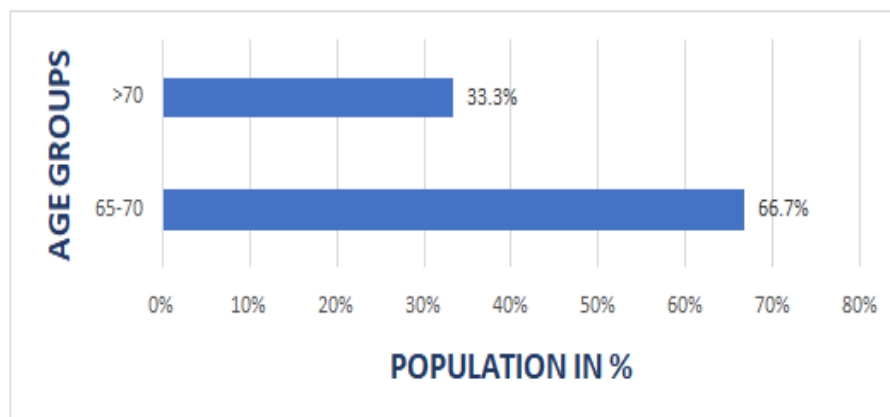


Figure 2: Gender Wise Distribution

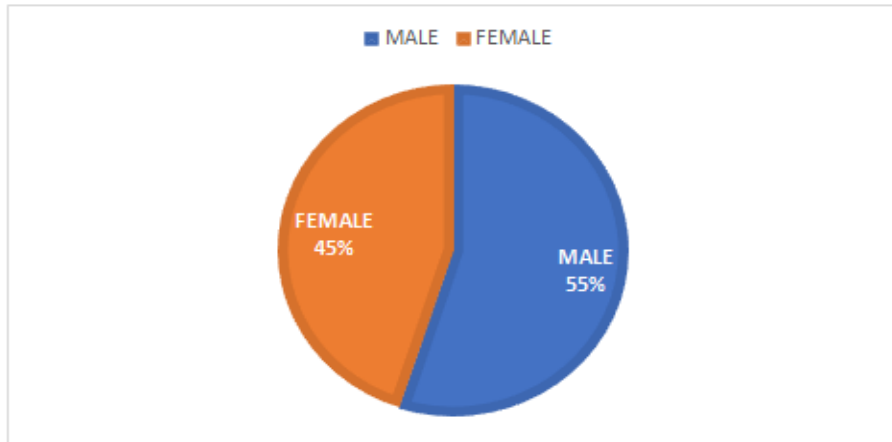


Figure 3: Diagnosis/ Condition Observed

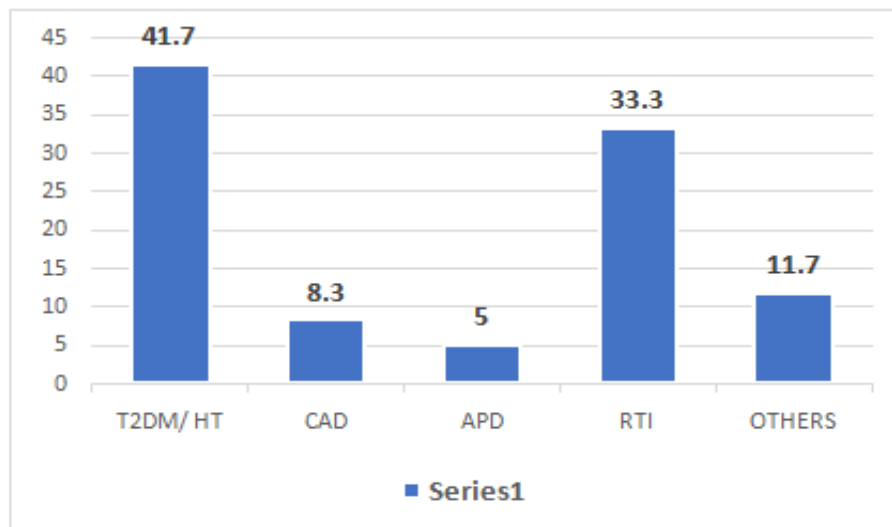


Figure 4: No. Of Drugs Wise Distribution

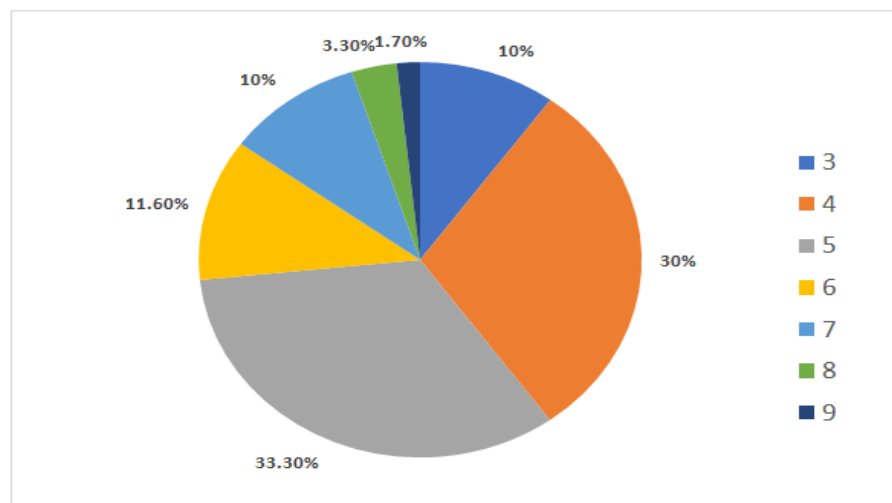


Figure 5: Drug Groups In Prescribed In %

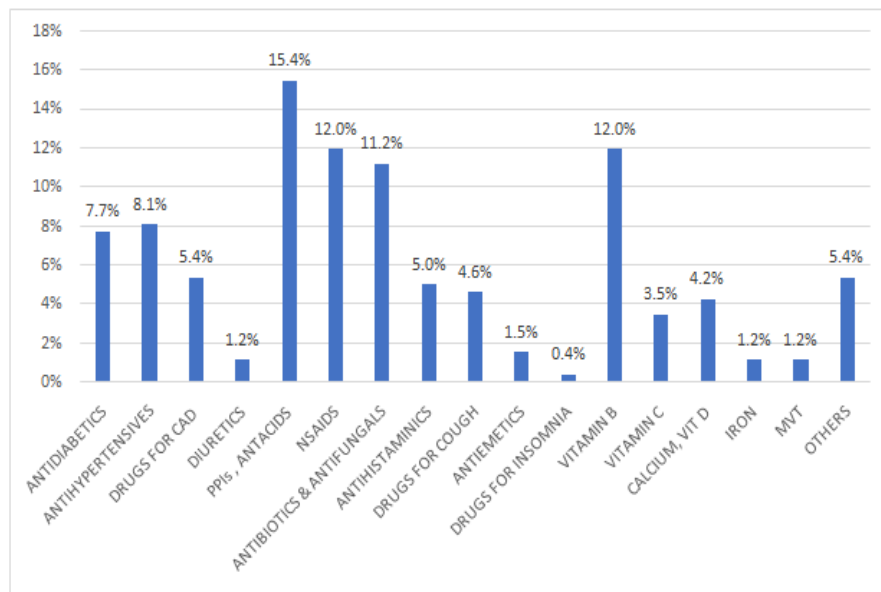
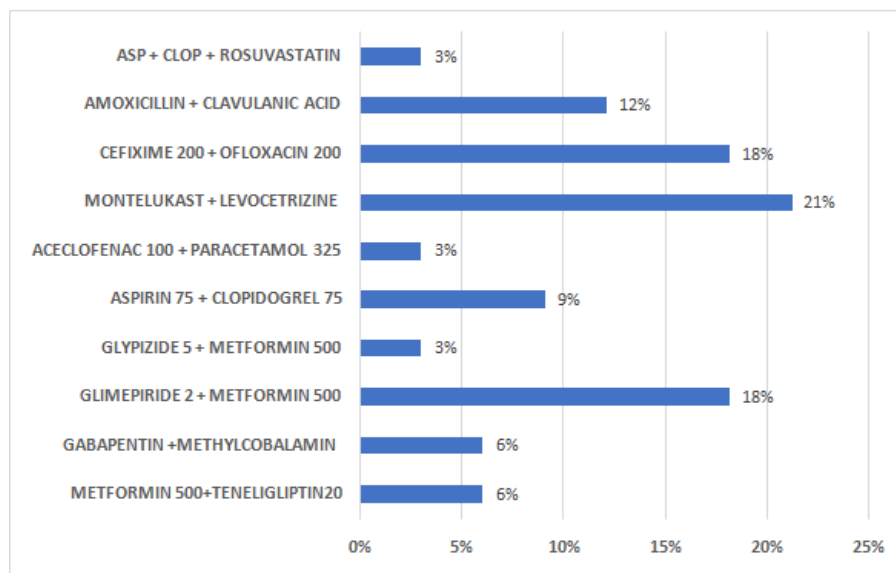


Figure 6: Fixed Drug Combinations (Fdc)



Discussion

The main aim of this study is to know the incidence of Poly therapy and its drug interactions in the geriatric patients. In the present study, the percentage rates of men treated were higher than females. The most common condition observed is Type 2 DM with HT (41.7%) which was also the most frequent comorbidity observed in a study done in Italy

on HCV related liver disease elderly⁵. In the present study, most of the patients (33.3%) were prescribed with five drugs. A study on Potentially Prescriptions Inappropriate (PPIs) in elderly patients in poly therapy done in Italy shown that 1/3 elderly patients taking > 5 drugs had reported an adverse reaction⁷. Therefore, the

“appropriate prescribing” is mandatory in the elderly patient^{9,12-14}.

The drug group which was prescribed the maximum among geriatric patients was Proton Pump Inhibitors (PPIs) & Antacids (15.4%) which is also the most frequent prescribed drug in a study done in Friuli Venezia Giulia region, Italy¹⁰. The second most prescribed drug in the present study was Vitamin B supplements (12%) & Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (12%).

A total of 8 FDCs (Fixed Drug Combinations) were observed in this study. Montelukast + Levocetirizine (21%) was found to be highly prescribed FDC since the second most common condition prevalent among the study-group was found to be Respiratory Tract Infections (RTIs) (33.3%); followed by Glimepiride 2 + Metformin 500 & Cefixime 200 + Ofloxacin 200 (18%).

The most important interactions occur between drugs that have serious toxicity, low therapeutic index, long half-life and a higher bound with plasma proteins⁴. The interactions can be divided into two broad categories: pharmacokinetic and pharmacodynamic interactions. Pharmacokinetics interactions include absorption, distribution, metabolism and excretion. Pharmacodynamic interactions refer to the effects resulting from the specific actions of the compounds which can be additive, synergistic or antagonistic¹¹. In this study, the pharmacokinetic DIs are more since there will be age related deterioration in pharmacokinetics of older individuals.

Out of total population under study, it is estimated that 21.6% of patients receiving polytherapy undergo interactions of clinical relevance out of which 10% have drug interactions with PPI since PPIs are the

most commonly prescribed drug in this present study whereas in an Italian study cross-sectional study, 9% of PPI users were exposed to potential DDI⁴. Among 10% PPI drug interactions in this present study, 6% were between PPI & Clopidogrel which was also reported in a European heart study¹⁸.

Long term treatment with PPIs decreases the absorption of vitamin B₁₂ & calcium leading to peripheral neuropathy & osteoporosis respectively. Prolonged use can also lead to achlorhydria & an increased susceptibility to certain bacterial infections¹⁹⁻²¹. These may lead to deterioration of health in elderly patients who are already weak due to chronic multiple illnesses & age-related changes.

Other DI is between Aspirin & Glimepiride (3%) which will be prescribed commonly in geriatric patients with diabetes & cardiac insufficiency. These drugs should be taken apart to avoid the protein binding interaction between them.¹⁹⁻²¹

Some common drugs are prescribed more than once especially when the geriatric patient consults different physicians for multiple systemic illnesses. This duplicative prescribing is common among elderly which can be avoided by examining the patient holistically. It is necessary to evaluate the patient's drug regimen periodically to minimize polytherapy and thereby drug interactions.

Conclusion

Polytherapy in Geriatric patients causes drug interactions, adverse drug reactions and poor compliance, which may increase number of hospital visits and economic burden on patients & significantly reduces the quality of life. It causes more harm than benefits. Therefore, prescribers should take utmost care when prescribing for multiple diseases in Geriatric patients to avoid drug interactions, adverse drug

reactions & duplicate prescribing. The optimal therapeutic regimen should combine guidelines, careful planning, social and economic considerations & periodical review. Minimum number of drugs in low doses with simple regimen is good for prescribing in Geriatric patients which will improve the quality & reduce the cost of health care.

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