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Analysis of the prevalence and pattern of polypharmacy among elderly patients admitted in general medicine department of a rural tertiary care hospital in South India

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ABSTRACT

Background: Quality and safety of prescribing drugs in older people remain a global healthcare concern. Inappropriate prescribing pattern in the elderly population is now considered as a major public health issue and polypharmacy is one of the common problems among the elderly patients. **Aims and Objectives:** The aims of this study were (1) to analyze the prevalence, pattern of polypharmacy with respect to age, and gender among the elderly patients and (2) to evaluate the most frequently prescribed drugs in the geriatric population. **Materials and Methods:** This prospective, cross-sectional, and observational study was conducted among the elderly patients admitted in the Department of General Medicine, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu. The duration of research project was 12 months from May 2018 to April 2019; approval for the study was taken from the Institutional Ethical Committee. Data on total number of prescribed drugs and main and adjuvant drugs prescribed to patients during treatment were collected and analyzed. **Results:** A total of 289 patients, that is, 167 male and 122 female were included in the study. The prevalence of minor polypharmacy (2–4 drugs) accounted for 15.22%, major polypharmacy (≥5 drugs) for 81.35%, and hyper polypharmacy (≥10 drugs) for 3.46%. Most commonly prescribed drugs were vitamins, proton-pump inhibitors, antipyretic agents, and H2 receptor blockers. They accounted for 21.70%, 5.78%, 5.42%, and 4.94%, respectively. **Conclusion:** Polypharmacy is a preventable and can be rectified by prescribing appropriate medications. In future, a multidisciplinary approach which will be involving doctors, nurses, and pharmacists, shall be implemented for rational use of drugs in elderly patients.

Key words: Polypharmacy; Geriatric patients; Beers criteria

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INTRODUCTION

Polypharmacy is one of the most common problems among the elderly patients. At the beginning of the 19th century, no country in the world had a life expectancy over 40 years.[1] In India, the elderly population is estimated at about 96 million, and this is expected to reach more than 316 million by 2050.[2] Aging is the process of changes in biological state which will have its own dynamics largely beyond human control.[3] The term "geriatrics" or "elderly" is referred to as a population with a chronological age of more than 65 years in most of the developed countries, but this will not apply very well to the developing countries. In January 1999, the Government of India adopted the "National Policy for Older Persons" by which "senior citizen" or "elderly" is defined as persons who are of the chronological age of 60 years or above.[4] The World Health Organization (1963) had defined "middle-age" as being

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45–59 years, "elderly" as being 60–74 years, and the "aged" as more than 75 years of age.[3] Based on the 2019 sample registration system census, total elderly population living in India was 8.1%.[5] Among the worldwide elderly population, 44% of men and 57% of women usually take five or more medicines per week.[6] Polypharmacy in the elderly has been interrelated with advance age and found to be linked with greater risk of emergency department visits, hospitalizations, hospital readmissions, and mortality in elderly people.[7] The symptoms caused by polypharmacy are generally resembled with the normal aging signs and symptoms in elderly, the likelihood features are as follows: tiredness, sleepiness, decreased alertness, constipation, diarrhea, bladder incontinence, loss of appetite, confusion, depression or lack of interest in their normal activities, weakness, tremors, anxiety, excitability, and dizziness.[8] The use of more medications than that are clinically indicated in a given patient is known as polypharmacy.[9,10] Polypharmacy is classified as major polypharmacy if >=5 drugs, minor polypharmacy if 2-4 drugs and hyper polypharmacy if 10 or more drugs are used by the patient per day respectively.[9-11]

Aims and objectives

The aims of this study were as follows:

1. To analyze the prevalence of polypharmacy with respect to age and gender among the elderly patients
2. To evaluate the prescription pattern, that is, most frequently prescribed drugs in geriatric population.

MATERIALS AND METHODS

This prospective, cross-sectional, and observational study was conducted in elderly patients admitted in the Department of General Medicine, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu. The duration of research project was 12 months from May 2018 to April 2019. Ethical approval was obtained from the Institutional Ethics Committee (reference number: IECHS/DSMCH/081/2018). The sample size was calculated with an absolute precision (d) of 5% using the formula $4p\ (100-p)/d^2=208.45$. The prevalence (p) of polypharmacy among elderly patients was around 84.6% based on a previous study which was conducted in Bengaluru, Karnataka among elderly patients.[4]

Inclusion criteria

The following criteria were included in the study:

1. Patients of both the genders aged 60 years and above
2. Hospital inpatient department care (IPD) patients admitted in the Department of General Medicine.

Exclusion criteria

The following criteria were excluded from the study:

1. Patients <60 years
2. Hospital outpatient care patients
3. Emergency patients like intensive care unit patients
4. Patients with hospital stay <3 days.

Data were collected after the 3rd day of admission from each patient and prevalence, pattern of polypharmacy, total number of prescribed drugs, and main and adjuvant drugs prescribed to patients during treatment were analyzed. Collected data were assessed for appropriateness and inappropriateness of medications prescribed to patients during treatment based on Beers criteria-2019. The American geriatrics society (AGS) Beers Criteria (AGS Beers Criteria) for potentially inappropriate medication (PIM) used for the elderly population are widely used by physicians, educators, researchers, health-care administrators, and regulators. The AGS Beers Criteria is a categorical list of PIMs that are typically preeminently avoided by elderly adults in utmost circumstances and under specific circumstances, such as in certain diseases or conditions.[11] The data collected were entered into excel sheets and then analyzed using the Statistical Package for the Social Sciences software version 21. Age and gender distribution and groups of drugs prescribed to the patients were expressed in percentages.

RESULTS

In this study, out of 289 elderly patients, 167 (57.78%) were male and 122 (42.21%) were female. The prevalence of hyper, major, and minor polypharmacy was 3.46%, 81.31%, and 15.22%, respectively. Major and minor polypharmacy was more among males as compared to females (Table 1).

Polypharmacy was more commonly seen in patients of 60–65 years age-group (60.55%) and least in >75 years age-group (8.99%), respectively (Table 2).

Most commonly prescribed drugs in elderly patients were vitamins, proton-pump inhibitors, antipyretic agents, H2 receptor blockers, statins, hematological agents, cephalosporins, antiemetics, calcium channel blockers, and aspirin, they accounted for 21.70%, 5.78%, 5.42%, 4.94%, 4.77%, 4.17%, 3.69%, 3.22%, 2.92%, and 2.56%, respectively (Table 3).

The prevalence of minor polypharmacy (2–4 drugs) accounted for 15.22 %, major polypharmacy (≥5 drugs) for 81.35 %, and hyper polypharmacy (≥10 drugs) for 3.46 % (Table 4).

Table 1: Relation of gender with grades of polypharmacy

Gender	Polypharmacy			Total (n=289) (%)
	Hyper (≥ 10 drugs)	Major (≥ 5 drugs)	Minor (2–4 drugs)	
Male	5	138	24	167 (57.78)
Female	5	97	20	122 (42.21)
Total	10 (3.46%)	235 (81.31%)	44 (15.22%)	289 (100)

Table 2: Relation of age-group with polypharmacy

Age-group	Polypharmacy			Total (n=289) (%)
	Hyper (≥ 10 drugs)	Major (≥ 5 drugs)	Minor (2–4 drugs)	
60–65 years	7	144	24	175 (60.55)
66–70 years	2	45	11	58 (20.06)
71–75 years	0	23	7	30 (10.38)
>75 years	1	23	2	26 (8.99)
Total	10 (3.46%)	235 (81.31%)	44 (15.22%)	289 (100)

Table 3: Drugs prescribed in elderly patients

Prescribed drugs	Total number of drugs (%)	Prescribed drugs	Total no. of drugs (%)
Penicillin antibiotics	33 (1.96)	Antiepileptics	17 (1.01)
Macrolide antibiotics	10 (0.59)	Antipsychotic drugs	6 (0.35)
Fluoroquinolones	27 (1.61)	Tricyclic antidepressants	4 (0.23)
Cephalosporins	62 (3.69)	Benzodiazepines	43 (2.56)
Antitubercular agents	9 (0.53)	Anti-Parkinsonism drugs	24 (1.43)
Aminoglycosides	3 (0.17)	Anti-vertigo drugs	9 (0.53)
Tetracycline antibiotics	9 (0.53)	Nootropics	20 (1.19)
Antiprotozoal agents	17 (1.01)	Gabapentin	9 (0.53)
Anti-helminthic drugs	11 (0.65)	Pregabalin	13 (0.77)
Antipyretic agents	91 (5.42)	Bronchodilators	16 (0.95)
Aspirin	43 (2.56)	Methylxanthines	13 (0.77)
Antispasmodic agents	3 (0.17)	Leukotriene receptor antagonists	18 (1.07)
Opioid analgesics	12 (0.71)	Antihistamines	17 (1.01)
Anticholinergic agents	3 (0.17)	Mucolytic agents	28 (1.66)
Diuretics	34 (2.02)	Corticosteroids	25 (1.49)
Calcium channel blockers	49 (2.92)	Insulin	30 (1.78)
ACE Inhibitors	11 (0.65)	Sulfonylurea	15 (0.89)
ARBs	12 (0.71)	Biguanides	25 (1.49)
Nitrates	10 (0.59)	Thiazolidinediones	1 (0.05)
Antiplatelet drugs	37 (2.20)	L–Thyroxine	6 (0.35)
Anticoagulants	5 (0.29)	Antiemetics	54 (3.22)
Cardiac glycosides	6 (0.35)	Proton-pump inhibitors	97 (5.78)
Alpha-adrenergic blockers	11 (0.65)	H2 blockers	83 (4.94)
Beta-blockers	22 (1.31)	Alkalinizing agents	38 (2.26)
Hematological agents	70 (4.17)	Lactobacillus	22 (1.31)
Statins	80 (4.77)	Vitamins	364 (21.70)

Table 4: Prevalence of polypharmacy in the elderly population

Polypharmacy	Frequency (n=289)	Prevalence %
Minor polypharmacy	44	15.22
Major polypharmacy	235	81.35
Hyper polypharmacy	10	3.46

DISCUSSION

Patients with multiple diseases are usually prescribed multiple drugs. The risk of adverse drug reactions, drug–drug interactions, and poor compliance increases with the increase in number of drugs prescribed.[12] It was noticed that many common drugs are apparently more toxic in old people than in adults such as digitalis and opioids.[13] Hence, making a strategy to treat elderly population is one of the most complex process, because elderly patients possess comorbidity and diseases which may affect the absorption, distribution, plasma protein binding, and excretion of several drugs that might alter the therapeutic intensities of drugs and, therefore, probabilities of increased vulnerability of under-dosing, overdosing, and toxicities of drugs.[14]

In a study conducted by Radhika et al.,[13] to evaluate polypharmacy in elderly patients, the prevalence of

polypharmacy was 82.8%, 5–8 drugs were prescribed for most patients (42.6%) followed by >8 drugs (40.2%). In this study, the most commonly prescribed drugs were antihypertensives (32%), antimicrobial drugs (24%), oral antidiabetic drugs (24%), and drugs acting on gastrointestinal system (20%), respectively. While, in our study, the prevalence of minor polypharmacy (2–4 drugs) accounted for 15.22%, major polypharmacy (≥5 drugs) for 81.35%, and hyper polypharmacy (≥10 drugs) for 3.46 %. Polypharmacy was more commonly seen in patients of age 60–65 years and least in >75 years. Most commonly prescribed drugs were vitamins, proton-pump inhibitors, antipyretic agents, H2 receptor blockers, statins, hematological agents, cephalosporins, antiemetics, calcium channel blockers, and aspirin, they accounted for 21.70%, 5.78%, 5.42%, 4.94%, 4.77%, 4.17%, 3.69%, 3.22%, 2.92%, and 2.56%, respectively.

Tamilselvan et al.,[15] conducted a study to analyze incidence of polypharmacy and drug-related problems among geriatric patients. The highest frequency of elderly patients with polypharmacy was from age group 65–70 years (65%). Most of the patients (43%) were taking 5–10 drugs. The most 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, and 8.60% of vitamins and minerals. While, in our study, polypharmacy was highest among elderly patients of age group 60–65 years (60.55%) and 81.35% patients were taking 5–10 drugs (major polypharmacy), vitamins (21.70%), and proton-pump inhibitors (5.78%) followed by antipyretic agents (5.42%) were the most commonly prescribed drugs among the elderly age group.

A study was conducted by Saldanha et al.,[4] to evaluate pattern, predictors, and outcome of polypharmacy among elderly perioperative patients, the prevalence of polypharmacy was 84.6% and prevalence of high level polypharmacy was 11.1%. The most common drugs related to surgery being used were pantoprazole (87.2%), pethidine (64.1%), and ondansetron (46.2%). Whereas, the most common surgery unrelated drugs prescribed were short-acting human insulin (36.8%), amlodipine (29.1%), and metformin (22.2%).Whereas, in our study, the prevalence of hyper polypharmacy (≥10 drugs) was 3.46% and most commonly prescribed drugs were vitamins, proton-pump inhibitors, antipyretic agents, H2 receptor blockers, and statins.

A study conducted by Pradhan et al.,[2] to evaluate prevalence of PIM in elderly, it was found that antimicrobials drugs (21.64%) were most frequently prescribed drugs, followed by drugs acting on cardiovascular system (19.75%), endocrine system (16.83%), analgesic and anti-inflammatory drugs (14.34%), vitamin, minerals, and dietary supplements (12.35%), and gastrointestinal system (9.16%). Among the antibiotics, 3rd-generation cephalosporins were the most widely prescribed followed by quinolones, whereas, in our study, vitamins, proton-pump inhibitors followed by antipyretic agents and H2 receptor blockers were the most commonly prescribed drugs and among the antibiotics cephalosporins followed by penicillins were most widely prescribed.

Elderly people are predominantly susceptible to drug-drug interactions, because they generally possess multiple chronic diseases and comorbidities, so the required number of medications to treat them is higher. Unfortunately, there are many negative concerns associated with polypharmacy. Precisely, the burden of taking multiple medications has been accompanied by greater health-care expenses. A multidisciplinary approach involving doctors, nurses, and pharmacists shall be implemented to work as a team for bringing out rational use of drugs in elderly patients.

Limitations of the study

In this study, only IPD patient's details regarding information of polypharmacy were collected, OPD elderly patient's details could also be included to compare the difference. There was no direct contact with patients and this study was not based on using a questionnaire to collect information on polypharmacy.

CONCLUSION

Our study has brought in focus the current practice of polypharmacy in hospitals, especially in elderly age group, in future, a multidisciplinary approach which will be involving doctors, nurses, and pharmacists shall be implemented for bringing out rational drug use to minimize polypharmacy especially in geriatric population. Polypharmacy is preventable and can be rectified by prescribing appropriate medications, rational use of drugs, and periodic evaluation of patient's drug regimen.

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GM- Concept and design of the study, manuscript preparation and revision, data collection, statistical analysis; **SS**- Data analysis, statistical analysis, manuscript preparation and revision; **PS**- Data analysis and statistical analysis; **VG**- Manuscript preparation, manuscript revision, data analysis; **VAPP**- Data collection.

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