

To Study the Level, Pattern and the Risk Factors of Polypharmacy among Elderly Admitted in a Tertiary Care Centre

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Abstract

Background: The proportion of older adults exposed to polypharmacy defined as use of multiple medications, is rapidly increasing in the last two decades. There are many negative medical consequences associated with polypharmacy apart from greater health care costs. Studies in developed world have revealed that people aged 65-69 years fill an average of 14 prescriptions per year and adults aged 80-84 years, and average of 18 prescriptions per year. The reduced homeostatic ability as people age, given changes in pharmacokinetics, pharmacodynamics and physiological reserve affects different regulatory systems in elderly subjects. *Aim And Objective:* The aim of the present study was to explore level and pattern and; the risk factors of polypharmacy among elderly admitted and discharged in Department of Medicine, Government Medical College, Jammu. *Materials and Methods:* The prospective study was carried out in the departments of general medicine, in government medical college hospital Jammu. A total of 650 patients who were admitted in the medicine ward of the hospital during this period were studied, out of which 100 patients aged 65 or more were included in the study. *Conclusion:* Our study suggests that current practice in our hospital is associated with greater polypharmacy and inappropriate medication use. A regular medication chart review particularly in the elderly, by the clinical pharmacist to discontinue unnecessary medication will reduce the polypharmacy and inappropriate medication use.

Keywords: Polypharmacy; Adverse Drug Events; Aging; Geriatrics; Internal Medicine; Multimorbidity.

Introduction

Adults, especially elderly adults, often live with chronic diseases and multiple co-morbidities, resulting in indications to prescribe several medicines. Studies from developed world have reported that more than 50% of older adults in institutions and 27% of those living in the community may be taking more than five prescribed medications daily [1,2,3,4], and the proportion increases with age. And as world's older population continues to grow at an unprecedented rate [5]; this brings with it many socioeconomic burdens and increased pressures at all levels of care, particularly the health care. In India,

as in other countries, size of elderly population is growing rapidly; from 5.6% of total population in 1961, it is projected to rise to 12.4% by year 2026 [3,4]. The older population – persons 65 years or older are numbered 46.2 million in 2014, representing about 14.5% of the U.S. population, yet, used 40% of all prescription drugs (a 70 percent increase in polypharmacy over 12 years). It was reported that people aged 65-69 years fill an average of 14 prescriptions per year and adults aged 80-84 years average 18 prescriptions per year [2,3,4]. Half of all Australians aged between 65-74 years and two-thirds of those aged 75 and over, reported taking 5 or more medicines daily [6]. It has been reported in various studies that even when majority of elderly were

receiving polypharmacy, there was no indication of regular medications review by a physician (48%) or having the potential adverse reactions explained to them. Only 28% of older adults reported receiving help, at least some of the time, in making a treatment plan, and only about 48% reported talking to a health professional about their treatment goals [7,8] even in countries with well developed health care systems. There are many negative consequences associated with polypharmacy apart from greater health care costs. Polypharmacy is associated with an increased risk of adverse drug events (ADEs), drug-interactions, medication non-adherence and many geriatrics syndromes (falls, incontinence and confusional states) [9,10]. It has been reported that up to 35% of outpatients and 40% of hospitalized elderly experience an Adverse Drug Event (ADE) accounting for approximately 10% of emergency room visits [11]. The avoidable cost from polypharmacy mismanagement among older adults has been estimated to be around \$1.3 billion, with a range of \$900 million to \$1.7 billion, in the United States [12]. Most of these costs are incurred through inpatient care and emergency room visits and hospitalizations due to complications and adverse drug events.

Aims and Objective

The aim of the present study was to explore level, pattern and the risk factors of polypharmacy among elderly admitted in Department of Medicine, Government Medical College, Jammu.

Materials and Methods

The prospective study was carried out in the department of general medicine, in government medical college and associated hospitals, Jammu for a period of six months.

The case records of about 650 patients who were admitted in the medicine ward of the hospital during this period were reviewed and out of 650, 100 patients aged 65 or more were included in the study. Informed and written consent was taken from all the patients or their attendants.

Data was collected through daily review of case sheets of all elderly patients admitted in department of medicine. Information regarding name, age, sex, date of admission, diagnosis, date of discharge, name and number of drug prescribed at the time of admission and discharge etc. were collected.

Case sheets of all the admitted elderly patients were reviewed each day during the study period. Elderly patients admitted more than once during the study period were only considered once for data collection

Results

A total of 650 patients were reviewed in the medicine ward and 100 patients aged 65 or more were included in the study.

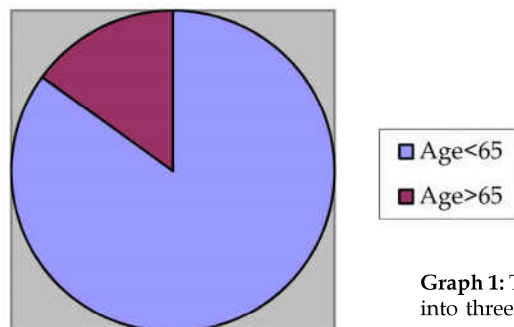
Group 1- 65-74 years

Group 2- 75-84 years

Group 3- >85 years

The patients were receiving treatment for various underlying diseases; the diabetes in 25, hypertension in 20 patients, chronic liver disease in 10 patients, chronic obstructive pulmonary disease in 12 and known malignancy in 11 patients, Other diagnosis observed in our study population were congestive cardiac failure, urinary tract infection, rheumatoid arthritis, cirrhosis of liver and acute and chronic hepatitis.

Percentage of patients with age>65years and <65 years in a total of 650 patients



Graph 1: The patients were further divided into three groups based on age

Table 1:

Group---1		Group -- 2		Group---- 3	
S. No.	Age	S. No.	Age	S. No.	Age
1	65	1	76	1	90
2	65	2	78	2	91
3	66	3	78	3	90
4	68	4	80	4	85
5	72	5	84	5	88
6	71	6	84	6	88
7	72	7	81	7	87
8	73	8	81	8	87
9	72	9	80	9	90
10	72	10	79	10	85
11	72	11	79	11	86
12	70	12	79	12	92
13	70	13	77	13	90
14	69	14	77	14	85
15	65	15	77	15	84
16	66	16	76	16	83
17	67	17	84	Mean	87.5625
18	68	18	84	Std.dev.	2.731758
19	71	19	83		
20	73	20	80		
21	73	21	80		
22	74	22	80		
23	74	23	79		
24	74	24	79		
25	71	Mean	79.79167		
26	72	Std.dev.	2.51913		
27	71				
28	70				
29	70				
30	66				
31	68				
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51	73				
52	72				
53	72				
54	71				
55	67				
56	67				
57	65				
58	65				
59	65				
60	66				
Mean	70.13333				

The study population had been prescribed with minimum of 4 drugs to the maximum of 15 drugs. Out of 100 patients included in the study, 45 (45%) patients were prescribed more than 5 drugs. In the age group 65-75 years, Out of 60 patients, 25 (41%) were prescribed more than 5 drugs. In the age group

75-85, 24 patients (45%) were prescribed 5 or more drugs and proportion increase to 56% in patients aged more than 85 years in which 9 out of 16 patients were receiving polypharmacy. The prevalence of polypharmacy substantially increased with age and with a higher number of chronic conditions.

Table 2:

Age group (years)	Number of patients	Gender Distribution
65-75	60	Males-35 Females-25
75-85	24	Males-14 Females-10
>85	16	Males-6 Females-10

Table 3:

Age (years)	<5 number of drugs	>5 number of drugs
65-75	35 Males-19 Females-16	25 Males-16 Females-9
75-85	13 Males-7 Females-6	11 Males-7 Females-4
>85	7 Males-2 Females-5	9 Males-4 Females-5

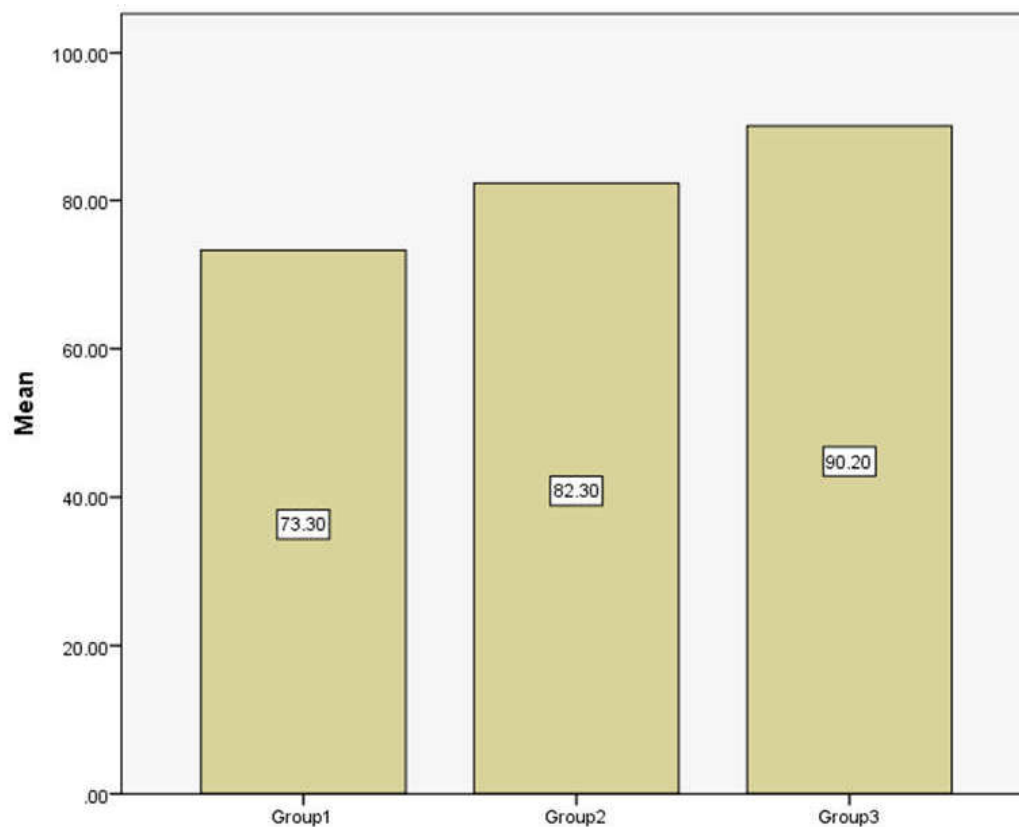


Fig. 2:

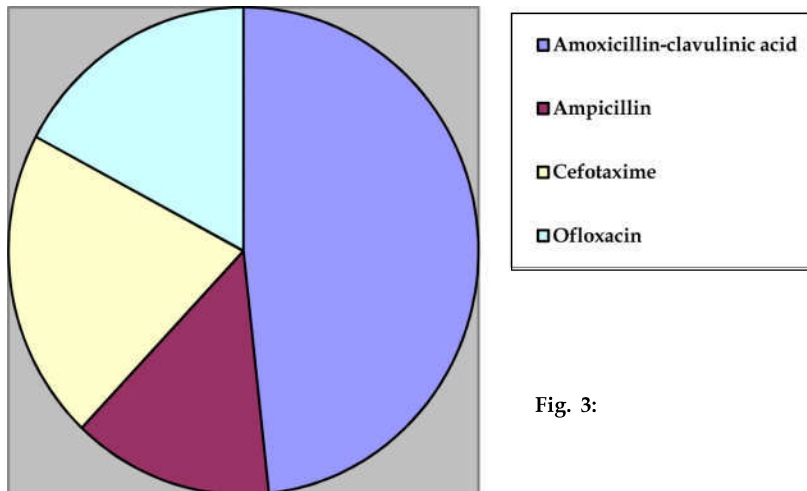


Fig. 3:

Antibiotics were widely prescribed (68.15%) Whereas, most commonly prescribed antibiotics were found to be Amoxicillin+Clavulanic acid with 28% followed by Ampicillin, Cefotaxime and Ofloxacin with 8%, 12% and 10 % respectively.

Amlodipine (32%), losartan potassium, (24%) and ramipril (12%) were commonly used antihypertensive agents

Proton pump inhibitor especially pantoprazole was the commonly prescribed anti-ulcer drug (74%) followed by ranitidine hydrochloride (70%).

The anti anxiety drugs were also widely used in elderly population. Alprazolam (70%) was mostly used sedative/ antianxiety

The analysis revealed that 57.4% of the overall prescriptions could be categorized as appropriate and 42.6% as inappropriate prescriptions, as described in the Beers criteria [13].

The top three classes of medications involved in our study were antibiotics, peptic ulcer disease and gastroesophageal reflux disease treating agents and antihypertensives, followed by anti-platelets, NSAIDS, antianxiety drugs and sedatives, drugs for dyslipidemia, multivitamins, antitussives, Mucolytics, Bronchodialators etc. The odds of exposure to polypharmacy were higher for older subjects, males and subjects living in urban centres.

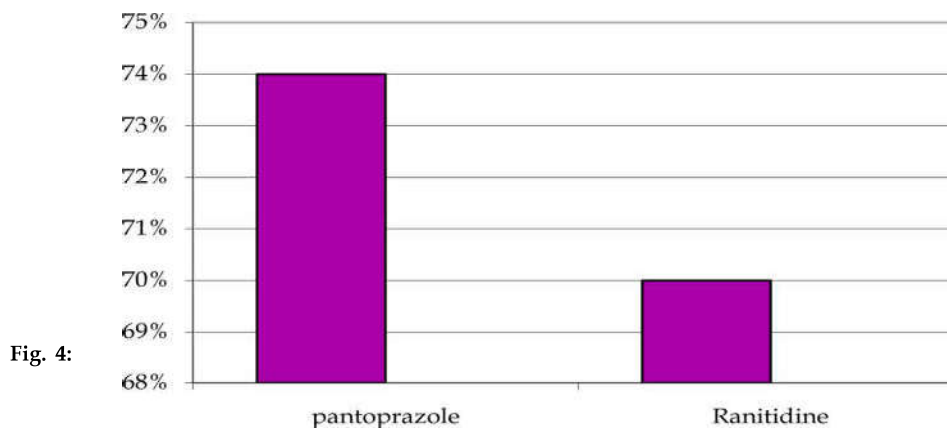


Fig. 4:

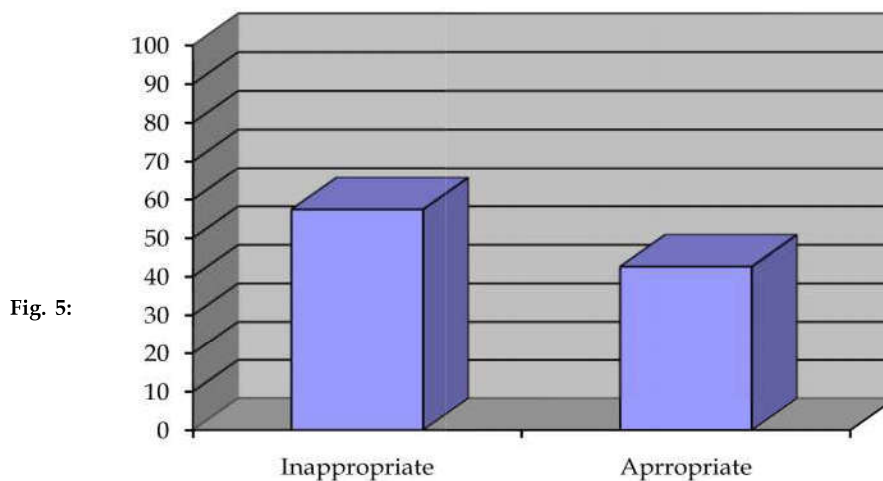


Fig. 5:

Discussion

As compared to young adults, elderly have more illnesses. Aging seldom comes alone: it is often accompanied by chronic (multiple) diseases, comorbidity, disability, frailty, and social isolation. The reduced homeostatic ability as people age, given changes in pharmacokinetics, pharmacodynamics and physiological reserve affects the different regulatory systems in elderly subjects. Some of the physiological changes [14] which occur in old age include progressive reduction in total body water and lean body mass causing increase in body fat. The atherosclerosis and loss of elasticity of vessel walls results in higher systolic arterial pressure and increased impedance to left ventricular ejection; in central nervous system (CNS) decline in receptors and pathways (fewer brain cells and connections) associated with decreased blood flow and enhanced response to agents acting on CNS; in gastrointestinal system (GI) decreased secretion of hydrochloric acid and pepsin, dysfunction in GI motility, decreased blood flow resulting in reduced absorption and metabolism of several drugs are common consequences of aging. Overall there is decreased immunity to diseases and greater susceptibility to infections resulting in increase in antibiotic use. There is loss of muscle tissue, osteoarthritis and osteoporosis with increased risk of falls and fractures resulting in increase in analgesic and anti-inflammatory drugs prescriptions. There is reduction of renal mass and blood flow causing decline in GFR, resulting in prolonged effects of many drugs. The sensory-visual impairment, hearing impairment, loss of sensitivity for high-frequency tones, decline in the ability to taste and smell are other factors which adversely affects the drug intake in this population. Further, it is unusual for elderly patients to have only one disease affecting only one organ or apparatus, even though, for example, acute pneumonia may be the ultimate cause of hospital admission for an 80-year-old woman, she will be most likely, also be suffering from, for instance, concomitant diabetes, heart failure, osteoporosis, anemia, and hypertension.

Over the last 20-30 years, problems related to ageing, multimorbidity and polypharmacy have become a prominent issue in global healthcare. The consequences of polypharmacy and drug interactions in elderly patients have already been documented by many researchers particularly in western countries. In India however, few studies have emphasized the role of polypharmacy and drug interactions among admitted elderly patients. However it is not difficult

to estimate the magnitude of problem, as size of elderly population is growing rapidly; from 5.6% of total population in 1961, it is projected to rise to 12.4% by year 2026.

Even when polypharmacy has been extensively studied in numerous observational and interventional primary studies in the past two decades; this important health problem still lacks a unique and precise definition. The use of multiple drugs, commonly termed as polypharmacy, has no universally agreed standard cut point with regard to the number of medications, (for the definition of polypharmacy) [15,16]. World Health Organisation (WHO) has defined polypharmacy as "the administration of many drugs at the same time or the administration of an excessive number of drugs". To operationalize the definition, researchers have arbitrarily chosen various cut points like use of five or more than five drugs simultaneously. An alternative definition for polypharmacy is the use of more medications than are medically necessary. For this definition, medications that are not indicated, not effective, or constitute a therapeutic duplication would be considered polypharmacy. Although this definition is clinically more relevant, it does necessitate a critical review of medication regimens [17].

It is not surprising that both the frequency of drug therapy and average number of drugs taken per person progressively increase with age as multimorbidity leads to use of multiple drugs. A European study involving 900 consecutive elderly patients admitted to university teaching hospitals in six countries found that potentially inappropriate prescribing ranged from 22 to 77%, depending on the criteria used [18]. The older population – persons 65 years or older and more represents about 14.5% of the U.S. population, yet, used 40% of all prescription drugs (a 70 percent increase in polypharmacy over 12 years). Thus People aged 65-69 years fill an average of 14 prescriptions per year and adults aged 80-84 years average 18 prescriptions per year. Similarly, half of all Australians aged between 65-74 years and two-thirds of those aged 75 and over, reported taking 5 or more medicines daily [1,2,3,4].

Out of 100 patients included in our study, 45 (45%) patients were prescribed more than 5 drugs. The incidence of polypharmacy increased with the age of the patient, a similar trend observed in studies carried out throughout the world. In the age group 65-75 years, 41% were prescribed more than 5 drugs followed by 45% in age group 75-85 and 56% in patients aged more than 85 years in our study.

Our study found no association between polypharmacy and age, sex or educational level. Some studies have reported an association between polypharmacy and sex of the patient [19], level of education, and/or a history of diabetes or hypertension [20] These differences could be the result of differences in the characteristics of the populations studied and/or sample size.

The chances of unintended adverse drug reactions (ADE) due to drug-drug interactions are greater in geriatric patients because an assortment of different drugs may be administered to a patient depending on the disease or symptoms. The medication that may have offered a benefit at a younger age or at a particular time might have little benefit for, and even harm in, the aging patient. However, despite the complexity of medication lists for many patients, less than half of older Canadians with chronic conditions reported having their medications reviewed by a physician (48%) or having the potential adverse reactions explained to them. Further, only 28% of older adults reported receiving help, at least some of the time, in making a treatment plan, and 48% reported talking to a health professional about their treatment goals [12,13]. An estimated 99,628 emergency hospitalizations occurred due to adverse drug events in the United States each year, with nearly 50% occurring in adults aged 80 or older. Unintentional overdoses were the cause of approximately 66% of the hospitalizations [21].

The rising trend of polypharmacy has several reasons, such as the rising use of cardio-protective and anti-depressant medications and probably also the promotion of guidelines recommending multiple drug therapy to achieve targets such as blood pressure or glycaemic control. Evidence supporting the benefits and risks of medications are usually established via randomized controlled trials in relatively young patients with a single morbidity and are often biased by the exclusion or under-representation of elderly people, especially those affected by multimorbidity and receiving polypharmacy. In most randomized clinical trials, sample size, duration, and co-prescribed drug therapies are often tailored to the target disease, and geriatric problems, such as disability, cognitive impairment, multimorbidity, life expectancy, and socioeconomic difficulties, are seldom considered [22]. The application of these guidelines to older patients with multiple comorbidities results in polypharmacy. For example, most studies on statin drugs for hyperlipidemia were conducted on people aged 70 years or younger. It is not known whether the benefits extend beyond that age or what the harms might be. Indeed, in the case of statins, applying the new cholesterol treatment

guidelines as advocated, will double the number of people eligible for statin therapy and thus, increase the number of people aged 60 to 75 years who are receiving statins, from 48% to 78 [23].

The top three classes of medications involved in our study were antibiotics, peptic ulcer disease and gastroesophageal reflux disease agents and antihypertensives, followed by other drugs.

Polypharmacy is associated with duplicate prescribed drugs and contraindicated prescribed drug combinations. In a population based study, outpatients taking 5 or more medications had an 88% increased risk of experiencing an ADE compared to those who were taking fewer medications. Another study evaluating unplanned hospitalizations in older veterans found that a patient taking more than 5 medications was almost 4 times as likely to be hospitalized from ADE [9,10,11]. A study in Scotland looked at 180,000 adults, in which 6% of patients had at least one unplanned hospitalization over the past year. Patients taking 10 or more medications were at a statistically greater risk for hospitalization than patients taking one to three chronic medications (24.8% vs. 5.2%; OR 1.25 95% CI 1.11 - 1.42) A study in Canada recently showed that in a group of elderly patients (mean age, 81 years), the average number of medications taken was 15 (range, 6-28) with 8.9 drug-related problems occurring per patient. When these problems were analyzed, 2.5 of those 8.9 problems were found to be caused by drugs that were not needed. In the United States, it is estimated that 28% of hospitalizations in seniors are caused by medication.

The potential for medication nonadherence rises with increased numbers of prescribed medications. Nonadherence to the prescribed drugs was also a common problem in our study. Nonadherence to prescribed medication has been estimated at 79%, 69%, 65%, and 51%, for once, twice, three, and four times daily administration, respectively [24,25]. It can be associated with subsequent reduced effectiveness. Medication nonadherence increases the risk of suboptimal drug treatment and its further consequences. Medication nonadherence has been estimated to cause 125,000 deaths in America annually and resulting in approximately 177 billion dollars increased costs of health care [25,26,27].

Conclusion

Our study suggests that prevailing standard of care in health care sector results both in greater use of polypharmacy and inappropriate prescriptions. There

is urgent need to create awareness about the situation by education to inform clinicians about the magnitude of the polypharmacy as also the phenomenon and the patient characteristics associated with polypharmacy. Raising physicians' awareness of polypharmacy may help to ensure safe, effective and appropriate use of medication in the elderly.

A regular medication chart review by the clinical pharmacist to discontinue unnecessary medication will reduce the polypharmacy and inappropriate medication use. It will also reduce the cost of the therapy which will ultimately benefit the patients. It is also necessary to improve the geriatric care as this age group possesses risk for more diseases and medication use. In future a multidisciplinary approach, involving physicians, nurses and pharmacists is required to ensure rational drug use in geriatric population.

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