

## AN INDIVIDUAL BASED STUDY OF THE GERIATRIC POPULATION: A POLYPHARMACY

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## ABSTRACT

Geriatrics is the branch of general medicine concerned with the clinical, preventive, remedial and social aspects of illness in the elderly. The prevalence of many disease increases with advancing age and as a result, elderly population often suffer from multiple co-existing conditions. The main objective of our study was to assess the polypharmacy and inappropriate medication usage in geriatric population. The prospective study was carried out in a multispecialty private teaching hospital at Coimbatore over a period of 9 months. The total number of patients admitted in the study site during the period of 850 patients. Among them 170 patients who were had aged > 65 years. Our study investigate that most predominant age group was young old 65-74 years. The average number of drugs been prescribed was found to be 7.47. Antibiotics were the commonly prescribed medicine with 62.35 %, whereas 95.88 % of the prescriptions were classified as major polypharmacy. Moreover 45.3 % of the prescriptions from the overall population contain inappropriate medications. Our findings reported that, thirteen drugs which has to be avoided by beers criteria 2002. In addition to that Propoxyphene, Amitriptyline, NSAIDS was found to be prescribed often in general medicine followed by diazepam and lorazepam by pulmonology and Amidorane by cardiology departments whereas inappropriateness was very high in a General medicine. Our article suggests that current practice in our hospital associated with greater polypharmacy and irrational use of drugs. In future, multidisciplinary approach, steps to be taken for rational drug use in geriatric population.

**Keywords:** Beers criteria 2002, Geriatrics, Inappropriate medications, Polypharmacy.

## INTRODUCTION

Geriatrics is the branch of general medicine concerned with the clinical, preventive, remedial and social aspects of illness in the elderly<sup>1</sup>. Officially the term elderly or geriatrics refers to the person or patient aged 65 years and above<sup>2</sup>. The term elderly is always related to physical inactivity, biological deterioration, disabilities and psychological failures<sup>3</sup>. The increase in life expectancy has posed one of the toughest challenges to be met by the health care professionals and by the society<sup>4</sup>. The increases in life expectancy too have been substantial.

In US, it was estimated that less than 15% of the total population was older than 65 years of age in 2004<sup>5</sup> by 2030 it will be 20%<sup>6</sup>. If medication related problems were ranked as a disease by cause of death, it would be the 5<sup>th</sup> leading mortality in United States<sup>7</sup>. Polypharmacy is particularly common among older adults around 20% of people over 70 years in the western world were taking five or more drugs<sup>8</sup>. In US, the elderly constitute about 13% of population, but they consume about 30% of all prescribed medications. Polypharmacy is one of the variables often associated with ageing were found to be the independent predictors of adverse drug reactions<sup>9</sup>. Larson reported the potential of adverse drug reactions occurrence equals 6 % among patients who got two kinds of drugs, 50 % among the patients taking 5 types of drugs and 50 % among the patient receiving 8 kinds of drugs<sup>10</sup>.

Data from third National Health and Nutrition Examination Survey (NHANES III) reveals that 74% of elderly people use prescription medications. Persons aged 65-74 years, half of them use 2 or more prescription drugs, 12% use 5 or more prescription drugs and those aged 75 and above, 60% use at least two prescription drugs and 16% use at least five<sup>11</sup>. Recent studies indicated that as much as 28% of hospitalizations of elderly patients are related to medication misadventures. 95% of these events are predictable and approximately 66% are preventable<sup>12</sup>. Use of potentially inappropriate medications in elderly patients is a major health care concern. It is likely to increase the risk of adverse drug events, which are estimated to be the fifth most common cause of death among hospitalized patients<sup>13</sup>. Poor adherence to medications is also a major public health problem and remains one of the main unresolved issues especially in the management of hypertension<sup>14</sup>. So we have decided to take up this study.

## MATERIALS AND METHODS

The prospective study was carried out in the departments of general medicine, cardiology and pulmonology of a 500 bedded multispecialty private teaching hospital for the period May 2009 to January 2010. The study was carried out by regular ward round participation to obtain relevant data by using previous designed protocol. Prior to starting research work, protocol of the research work, includes objectives, methodology and need for investigation. Which has been submitted to the Dean of the hospital to get an approval. However, patient information proforma was prepared, and analyzed. Whereas inform consent form was collected from all the patients.

**Inclusion criteria:** Patients admitted to general, special, deluxe wards of departments of General medicine, Pulmonology and Cardiology who were of age above 65 years were included.

**Exclusion criteria:** Out Patients and terminally ill patients.

## RESULTS

A total of 850 patients were admitted in the study site, in which 170 cases were found to be geriatrics with 58.82% males. Whereas 55.27% represented general medicine, 26.47% represented pulmonology, and 18.23% represented cardiology. 64.7% of patients of young old category (65-74 years) were the most prevailing age group in both genders. The details were depicted in Fig: 1 and Fig: 2. 31% of the overall population had a minimum of 2 disorders. In addition to that average number of disorder was found to be  $2.46 \pm 0.63$  with 35% hypertension followed by 28.83% type II diabetes mellitus, 17% ischemic heart disease and chronic obstructive pulmonary disease 14%.

Antibiotics were widely prescribed (62.35%) Whereas, most commonly prescribed antibiotics were found to be ceftriaxone sodium with 30% followed by cefuroxime, gentamicin, and ofloxacin with 8%, 12% and 10 % respectively. However, anti-ulcer drugs (61%) and anti-anxiety drugs (48%) were frequently prescribed. Moreover, Etophylline and theophylline combination (65%) was widely used in geriatrics population. Amlodipine (42%), losartan potassium, (34%) and ramipril (12%) commonly used antihypertensive agents. Proton pump inhibitor especially pantoprazole was the commonly prescribed anti-ulcer drug (74%) followed by ranitidine hydrochloride (70%) was widely prescribed anti-ulcer agent. In addition to that heparin (77%) was frequently

used anti-coagulant. Alprazolam (70%) was mostly used sedative/anti-anxiety. The details of the overall class of drugs prescribed were shown in Table: 1.

The study population had been prescribed with minimum of 4 drugs to the maximum of 14 drugs. The average number of drugs been prescribed was found to be 7.47. In our study 12% of population had been prescribed with 2-4 drugs, 61.18% with more than 5 drugs i.e. with 5-8 drugs and 33.52% with 9-12 drugs. A very less percentage of the population (1.18%) had been prescribed with more than 12 drugs whereas 95.88% prescription was classified as major polypharmacy. The analysis also revealed that 100% of prescriptions belonging to cardiology and 99% of the prescriptions belonging to general medicine. The prescriptions were also categorized based on the

appropriateness of the medications prescribed by the Beers criteria 2002 method. The analysis revealed us, 57.4% of the overall prescriptions was categorized as appropriate and 42.6% was categorized as inappropriate prescriptions. The drugs have to be avoided in the geriatrics as described in the Beers criteria was given in the following Table: 2. whereas drugs that were inappropriately prescribed in the particular diseased conditions were also identified and given in the Table: 3

Our study result shows that 58.23% of prescriptions had therapeutic polypharmacy with pulmonology and General medicine departments of 66.67% and 57.44% respectively. Our study reported that 73.35% of prescriptions were found to be rational with multiple drug use.

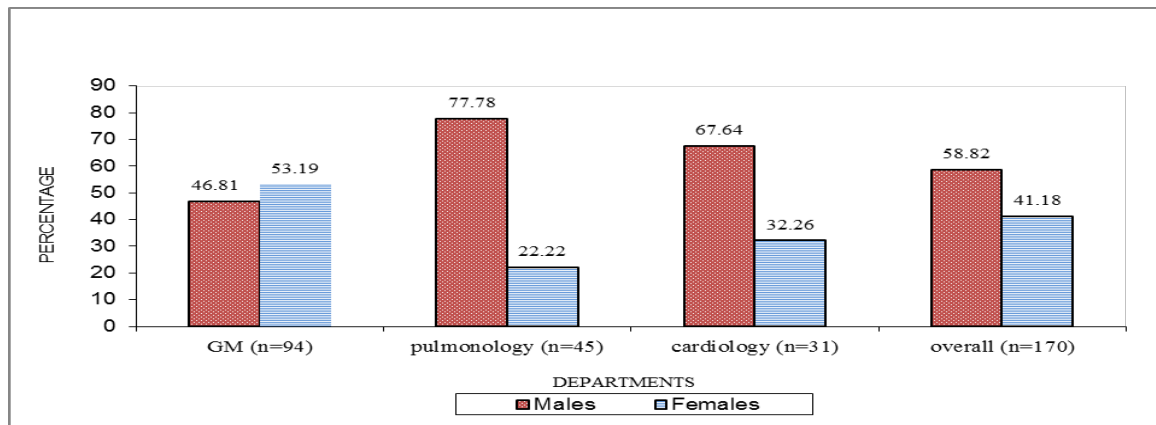


Fig. 1: Gender distribution of patients

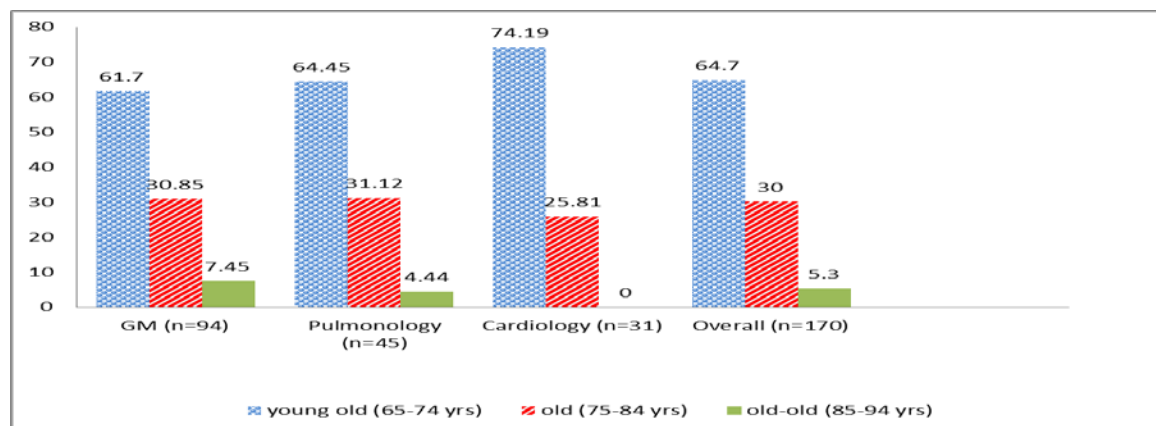


Fig. 2: Age distribution of study patients

Table 1: Other categories of drugs prescribed

Drugs	GM (%)	Pulmonology %	Cardiology (%)	Overall %
Vitamins	31.91 (30)	15.56 (7)	3.22 (1)	22.35 (38)
Antiemetics	24.46 (23)	8.9 (4)	32.26 (10)	21.76 (37)
Antiprotozoal	20.21 (19)	6.67 (3)	-	12.94 (22)
Antipyretic	12.76 (12)	11.12 (5)	-	10 (17)
Prokinetics	14.89 (14)	6.67 (3)	-	10 (17)
Narcotic analgesics	13.82 (13)	-	6.45 (2)	8.82 (15)
Antiarrhythmics	3.19 (3)	2.23 (1)	25.81 (8)	7.05 (12)
Mucolytic/decongestants	2.12 (2)	15.56 (7)	9.67 (3)	7.05 (12)
Nebulisation (bronchodilator + steroid)	-	26.67 (12)	-	7.05 (12)
Anti tussives	4.25 (4)	17.78 (8)	-	7.05 (12)
ATT	3.19 (3)	17.78 (8)	-	6.47 (11)
Anti lipidemic	-	-	35.5 (11)	6.47 (11)
Appetite stimulant	8.51 (8)	-	-	4.70 (8)

Table 2: List of inappropriate drugs prescribed as described by beers criteria 2002

S. No	Drugs	Concern	Severity rating
1.	Propoxyphene (GM)	Offers few analgesic advantages over acetaminophen, yet has the adverse effects of narcotic drugs.	Low
2.	Amitriptyline, Amitriptyline + chlordiazepoxide. (GM)	Because of its strong anti-cholinergic and sedative properties these are rarely the antidepressant of choice for elderly patients.	High
3.	Diazepam	The drug has a long half-life in elderly patients (often several days) producing prolonged sedation and increasing the risk of falls and fractures. Short and intermediate acting benzodiazepam's are preferred if a benzodiazepine is required	High
4.	Digoxin dose > 0.125 mg/day	Decreased renal clearance may lead to increased risk of toxic effects.	Low
5.	Hyoscyamine (GM)	GI antispasmodic drugs are highly anticholinergic and have uncertain effectiveness. These drugs should be avoided.	High
6.	Chlorpheniramine	Because of their potent anticholinergic properties, Non anticholinergic anti histamines are preferred in elderly patients when treating allergic reactions.	High
7.	Ketorolac	Immediate and long term use must be avoided since a significant number have asymptomatic GI pathological conditions	High
8.	Bisacodyl (GM)	Long term use may exacerbate bowel dysfunction.	High
9.	Nifedipine (GM)	Potential for hypotension and constipation	High
10.	Chlorzoxazone (GM)	Most muscle relaxant and anti-spasmodic drugs are poorly tolerated by elderly patients since these cause anticholinergic adverse effects, sedation and weakness. Additionally their effectiveness at doses tolerated by elderly patients is questionable.	High
11.	Cyproheptadine, Hydroxyzine (GM)	Have potent anticholinergic properties. Non anticholinergic antihistamines are preferred in elderly patients when treating allergic reactions.	High
12.	Lorazepam (Pulmonology)	Increased sensitivity to benzodiazepines in geriatrics, smaller doses may be effective as well as safer	High
13.	Amiodarone (Cardiology)	Associated with QT intervals problems and risk of provoking torsades de pointes. Lack of efficacy in older adults.	High

Table 3: List of inappropriate drugs prescribed according to disease or conditions as described by beers criteria 2002

Disease or Condition	Drug	Concern	Severity rating
Gastric ulcer (General medicine)	NSAID's (diclofenac sodium ketaloc)	May exacerbate existing ulcer or produce new ulcers	High
COPD (Pulmonology)	$\beta$ -blocker (carvidolol)	May induce respiratory depression.	High

## DISCUSSION

Polypharmacy and associated adverse drug reactions have been reported from many countries around the globe<sup>15-18</sup>. It is well established that older adults are more likely to be affected by multiple chronic conditions, thus increasing the likelihood that they take several or more medications concurrently<sup>19</sup>. In developing countries like India there are no stringent regulations about the use of drugs. In most of the hospitals there is no clinical pharmacist personnel's and this makes irrational use of drugs. The geriatric patients with a multiple diseases had consumed more drugs and have higher chance of polypharmacy and inappropriate drug usage. The purpose of this study was to assess the polypharmacy and related factors like how the lack of personalized care in geriatric patients will leads to irrational use of drugs and higher polypharmacy in our hospital.

The present study revealed that males were more than females which was comparable to study done in Indonesia<sup>20</sup>. The average age of the study population was 78.8 years with most prevailing age group of young old (65-74 years). As age increases an increasing vulnerability to develop diseases and the tendency to acquire multiple and chronic diseases was common. Educational status reveals 40.5% were illiterates and only 10.5% had a graduate level of education. The educational status may help the health care provider for giving better treatment. Our investigations show that special attention should be given to the uneducated patients and improve the patient's knowledge about disease which helps health

care provider in treating the disease. 82 % of the patients have two or more disorders. In addition to that atypical disease presentation and physician prescribing habits have resulted in multiple drugs use. Major Polypharmacy was often occurred as 95.88 % of the patients received more than 5 drugs and 4.12% of them had been prescribed with 2-5 drugs. The regular medication chart review was not done on regularly basis to avoid the unnecessary drugs being prescribed to the patients until the patient gets discharged and thus lack of close monitoring and individualized care results in more number of drugs prescribed to patients. This finding was comparable to the study done in Nepal population<sup>21</sup>. However 16 % of patients received 15 drugs in their study which was contrast to our study where we find only 1 % of patients received more than 12 drugs. In present study the average no of drugs prescribed was found to be 7.43 which increase the risks of adverse drug reactions. Of the admitted patients 63 % of patients receive antibiotics. This was less when compared to the findings of lohani sp *et al*<sup>21</sup> whereas 73% of the study patients receive antibiotics whereas 45.3 % of prescriptions were categorized as inappropriate polypharmacy by comparing with beer criteria 2002 and also patient takes several concomitant drugs, all of which are for recognized indications and are prescribed appropriately was assessed. As many researchers reported 14-46% of elderly people were prescribed with at least one inappropriate medication. Our present study also revealed that 45.3% of inappropriate prescriptions, however 13 drugs which have to be avoided irrespective of medical conditions in geriatrics were found to be prescribed. The inappropriateness was very high in the

department of general when compared to other departments. It was due to the NSAIDS were prescribed to most of the patients who is having the gastric ulcer and also Amitriptyline which is were also widely used in this department. Adequate training and education programs for the physicians and other health care providers by the clinical pharmacist will reduce this kind of inappropriate prescribing. However compared to Singapore studies<sup>22</sup> this was very much lower whereas 72 % of prescriptions have inappropriate medications. In addition to that 59 % of the patient's prescriptions were categorized as therapeutic polypharmacy which revealed that there was a careful patient monitoring. The department of cardiology was found to have slightly greater value of contra therapeutic polypharmacy i.e. 51.6%, where compared to other departments the values were very well below 43%. The contra therapeutic polypharmacy was observed in the prescriptions because of lack of monitoring the values like renal parameters, electrolytes, blood counts etc. An overall 73.35% of the study population's prescriptions were found to be rational with multiple drug use. The rationality was observed with the pulmonology and cardiology patients with the values of 86.66% and 74.19% respectively. In pulmonology department all the patients were subjected to the culture sensitivity test before starting antibiotics which was not followed in other departments and also management of side effects by taking patient history in to consideration followed by reducing the dose or prescribing the alternatives. In general medicine department the higher irrationality is due to poor medication chart review, followed by treating side effects of the drugs by another drugs by the nurses without the knowledge of the physicians. Management of conditions with multiple medications was necessarily associated with the minimal use of multiple drugs with careful patient follow up, but sometimes-inappropriate use of multiple drugs which overweighs the benefits may happen. The physicians were also taking lesser extent about the alternative systems of medicines. It was not only the role of physicians but also the patients themselves should reveal the use of other drugs from alternative systems of medicine, so that the physicians can plan for better care.

#### CONCLUSION

Our study suggests that current practice in our hospital associated with greater polypharmacy and inappropriate medication use. 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, steps to be taken involving physicians, nurses and pharmacists has to work as team for bringing out rational drug use in geriatric population.

#### REFERENCES

1. Elaine J. Amella. Geriatrics and Palliative Care: Altered Presentation of Health Problems. *Journal of Hospice and Palliative Nursing*. 2003;5(1)
2. Volkert D *et al*. ESPEN Guidelines on Enteral Nutrition: Geriatrics. *Clinical Nutrition*.2006; 25: 331-2.
3. Prakash Bhattacharya. Implications of an aging population in India: challenges and opportunities. Presented at the Living to 100 and Beyond Symposium. Orlando, Fla. January 12-14, 2005.
4. Report of the American Medical Association council on Scientific Affairs: Improving the quality of Geriatric pharmacotherapy; 2002.
5. Older patients at risk for prescription medication injuries. *Association of perioperative nurses journal*. May 2003.
6. Olshansky, S. Jay, Dana P. Goldman, Yuhui Zheng and John W. Rowe. Aging in America in the Twenty-first Century: Demographic Forecasts from the MacArthur Foundation Research Network on an Aging Society. *The Milbank Quarterly*.2009; 87(4):842-62.
7. Donna M *et al*. Updating the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults.*Arch Intern Med*. 2003; 163: 2716-24.
8. Rollason V, Vogt N. Reduction of polypharmacy in the elderly: a systemic review of the role of the pharmacist. *Drugs Aging* 2003; 20:817-32.
9. Hohl CM, Dankoff J, Colacone A, Afilavo M. Polypharmacy, adverse drug-related events and potential adverse drug interaction in elderly patients presenting to an emergency department. *Annals of emergency medicine*. 2001; 38: 666-71.
10. Larsen PD, Martin JH. Polypharmacy and elderly patient. *AORN Journal*. 1999; 69: 619-28.
11. Reamer L Bushardt, Emily B Massey, Temple W Simpson, Jane C Ariail, Kit N Si m *et al*. Polypharmacy: Misleading, but manageable. *Clin Interv Aging*. 2008; 3(2): 383-89.
12. Dennehy CE, Kishi DT, Louie C. Drug-related illness in emergency department patients. *Am J Health Syst Pharm*.1996 Jun; 1422-26.
13. Hanlon JT, Schmader KE, Ruby CM, Weinberger M. Suboptimal prescribing in older inpatients and outpatients. *J Am Geriatr Soc*. 2001;49:200-09
14. Amal Khalil Turki and Syed Azhar syed sulaiman. Elevated blood pressure among patients with hypertension in General hospital of penang, malaysia: does poor adherence matter? *International journal of pharmacy and pharmaceutical sciences*.2010; 2(1): 24-26
15. Bretherton A, Day L, Lewis G. Polypharmacy and older people. *Nurs Times*. 2003; 99(17): 54-55.
16. L, Sigaard J, Hallas J, Kragstrup J. Polypharmacy in general practice: difference between practitioners. *Br J Gen Pract* 1999; 49 (440): 195-8.
17. Hogerzeil HV, Bimo RDD *et al*. Field tests for rational drug use in twelve developing countries. *Lancet* 1993; 342: 1408-10.
18. Martin I, Hall J, Gardner T. Prescribing for patients aged 65 years and over in New Zealand general practice. *NZMed J*. 2002; 115(1164):U221.
19. Stawicki SP and Gerlach AT: Polypharmacy and medication errors: stop, listen, look and analyse. *OPUS 12 Scientist* 2009; 3(1):6-9.
20. Fita rahmawati I, Dewa putu pramantara, Wasilah rohmah, Syed azhar syed sulaiman: Polypharmacy and unnecessary drug therapy on geriatric hospitalized patients. *International Journal of Pharmacy and Pharmaceutical Sciences* 2009; 1(1):6-11.
21. Lohani SP, Thapa P, Aryal UR, and Satyal KR. Polypharmacy and Geriatric Patients: Patterns of Prescribing in the Tribhuvan University Teaching Hospital in Nepal. *Journal of Nepal Health Research Council*; 4(1):1-4.
22. Mamun K, Lien CT, Goh- Tan CY, Ang WS: Polypharmacy and Inappropriate medication use in Singapore nursing homes. *Ann Acad Med Singapore*. 2004; 33: 49-52.