

A prospective observational study of prescription appropriateness of elderly hypertensive patients using Beers criteria in a tertiary care teaching hospital

Supriya K. H.¹, Shashi Kumar N. S.^{1*}, Prakash G. M.², Sareetha A. V.¹

¹Department of Pharmacology,

²Department of General Medicine, MIMS, Mandya, Karnataka, India

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***Correspondence to:**

Dr. Shashi Kumar N. S.,
Email: shashikumar.boss@gmail.com

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ABSTRACT

Background: The prevalence of hypertension has been increased among the urban population especially among the elderly. Use of inappropriate medication is one of the major problems seen among elderly age group above 60 years who take more medication when compared to that of younger population. Inappropriate prescriptions can be avoided by identifying safer pharmacological alternatives and also utilizing non-pharmacological therapy. Quality and safety of prescribing in elderly patients is one of the global healthcare concern and efforts should be made to improve appropriateness of medication among this group of population. This study was done to assess the relationship between inappropriate medication use and its health outcomes in elderly hypertensive population.

Methods: A prospective observational study was conducted over a period of 3 months, after getting approval from Institutional Ethics Committee. Total of 117 elderly hypertensive patients aged >60 years were analysed for three months duration for the rationality of medication prescribed using Beer's criteria and the health outcome due to inappropriate medication use.

Results: Out of 117 elderly hypertensive patients analysed, 49 (41.9%) were males and 68 (58.1%) were females. Most of the patients had associated co morbid illness like diabetes mellitus (48.7%), respiratory diseases (24.8%), cerebrovascular accident (30.8%), cardiovascular diseases (19.7%), fever (13.7%), anaemia (9.4%), etc. Out of 117 patients <5 drugs were used in 6.8%, 5-10 drugs were used in 89.7% and >10 drugs were used in 3.4% of cases. Antihypertensive drugs that were commonly used in our study was calcium channel blocker (52.1%), diuretics (42.7%), Angiotensin converting enzyme inhibitors (36.8%), β -blockers (17.1%) and Angiotensin receptor blockers (11.1%). Adverse health effects like drug induced gastritis, electrolyte imbalance, metabolic dysfunction and renal impairment was seen in few patients because of inappropriate medication.

Conclusions: Use of inappropriate medication is one of the major problems seen among elderly, because of the co morbid illness associated with the primary disease which leads to polypharmacy. Prescription inappropriateness was seen among 86.3% of elderly hypertensive patients as per Beers criteria which may be because of comorbid illness that was seen among these patients. It is necessary to implement certain policies in geriatric healthcare to prevent the poor outcome due to drug therapy.

Keywords: Beers criteria, Co- morbid, Hypertension

INTRODUCTION

Prescribing medication is one of the complex tasks in the management of any disease.¹ Use of inappropriate medication is one of the major problems seen among

elderly age group above 60 years who take more medication when compared to that of younger population.² Inappropriate prescribing has been defined as prescribing of medication that has more potential risk than potential benefit or prescribing that does not agree with the accepted

medical standard.¹ Medication related problems are common, costly and often preventable in older adults which lead to poor outcome.³ Hospitalization cost due to inappropriate prescription was estimated to be \$20 billion by FDA.² Potentially inappropriate medication prescribing is prevalent among older population in whom the prevalence of chronic disease, disability and dependency is higher than younger adults.⁴

According to 2011 census elderly population aged above 60 years account for 8% of India's population, roughly 93 million people.⁵ Due to demographic transition the older age group above 60 years is being rising which has led to rise in burden of non-communicable disease and challenge the health care delivery.⁵ The prevalence of hypertension has been increased by 30 times among the urban population over a period of 55 years and about 10 times among the rural population over a period of 36 years.⁶ It is the third most important risk factor leading to public health burden on cardiovascular health status and healthcare systems in India. About 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India are due to hypertension.⁷ Though hypertension can lead to cardiovascular risk in elderly patient, blood pressure should not be excessively decreased since it can impair the target organ perfusion and also impair the autoregulation.⁸

Hypertension in elderly patient should be treated carefully as they are more prone to adverse effects of antihypertensive drugs and have more comorbid disease and are at risk of orthostatic hypotension, dizziness and falls. Treating hypertension is more cost effective than treating the outcome of hypertension.⁹ Process or outcome measures like explicit (criterion based) or implicit (judgement based) indicators can be used to assess prescription appropriateness. Explicit indicators are developed from reviews, expert opinions that are usually drug or disease oriented which can be applied with little or no clinical judgement. Implicit indicators utilizes patient specific information and published evidence to assess prescription appropriateness, it is more sensitive.¹⁰

In order to prevent adverse reactions in the elderly it is important to identify the pattern of inappropriate use of medicines in this population. There are certain medication assessment tools which can be utilized by the clinicians to evaluate rationality/appropriateness of medication regimens in elderly.¹¹ To evaluate the appropriateness of drugs prescribed for elderly, Beers defined criteria for potentially inappropriate medicines in 1997 which was updated in 2003 later it was further updated by American Geriatric Society in 2012.¹² Beer's criteria were developed to improve prescribing practices for older adult patient in order to reduce or avoid potential risk and complication.

Drugs are classified into three groups according to Beer's criteria:

- Drugs to avoid in older adults.

- Drugs to be avoided in cases of specific drug-disease or drug syndrome interaction.
- Drugs to be used with caution in older adults.

The goal of the Beers Criteria is to improve the effectiveness and safety of prescription practices for geriatric patients.⁹ Inappropriate prescriptions can be avoided by identifying safer pharmacological alternatives and also utilizing non-pharmacological therapy that substitutes these medications, thereby highlighting that a "less-is-more approach" is often the best way to improve health outcomes in older adults.³

Polypharmacy which is highly prevalent in elderly, lead to increased incidence of adverse drug reactions, drug interactions and compliance errors. The risk of polypharmacy increases with those taking more than five medications per prescription.¹¹ The changes in the physiologic function with age and disease may be the reason for risk associated with medications. Changes in physiologic function due to either normal aging or underlying comorbid disease can make beneficial prescribing more challenging in this population.¹³ Quality and safety of prescribing in elderly patients is one of the global healthcare concern and efforts should be made to improve appropriateness of medication among this group of population.¹³ Since geriatric population is increasing and it is the age group who are more prone for chronic disease condition and are liable to be prescribed with inappropriate drugs which can lead to adverse drug effect. This study was done to assess the relationship between inappropriate medication use and its health outcomes in elderly hypertensive population.

METHODS

A prospective observational study was initiated after approval from the Institutional ethical committee and the study was done over a period of three months. All elderly hypertensive patients admitted to the hospital in Medicine Department, MIMS, Medical College Teaching Hospital, Mandya were enrolled for the study, after explaining the study requirement in the language they understand and after obtaining written informed consent.

Wards of Medicine Department were visited, all elderly patients admitted with the history of hypertension for treatment were enrolled for the study. Data regarding age, relevant history, blood pressure recording, history of other comorbid illness was collected along with data regarding medication prescribed, effect of medication and outcome was collected in a predesigned proforma. Patient was followed up till discharge from the hospital.

Statistical methods

Data entry and analysis were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 20.0; SPSS Inc). Descriptive statistics was used for analysing data.

RESULTS

Out of 117 elderly hypertensive patients analysed, 49 (41.9%) were males and 68 (58.1%) were females (Table 1).

Table 1: Demographic data.

Gender	Number (%)
Males	49 (41.9%)
Females	68 (58.1%)
Total no. of prescriptions assessed	117
Total no. of drugs prescribed	807
Inappropriate prescriptions	101 (86.3%)

Most of the elderly patients included in the study had associated co morbid illness like diabetes mellitus (48.7%), respiratory diseases (24.8%), cerebrovascular accident (30.8%), cardiovascular diseases (19.7%), fever (13.7%), anaemia (9.4%) etc (Figure 1).

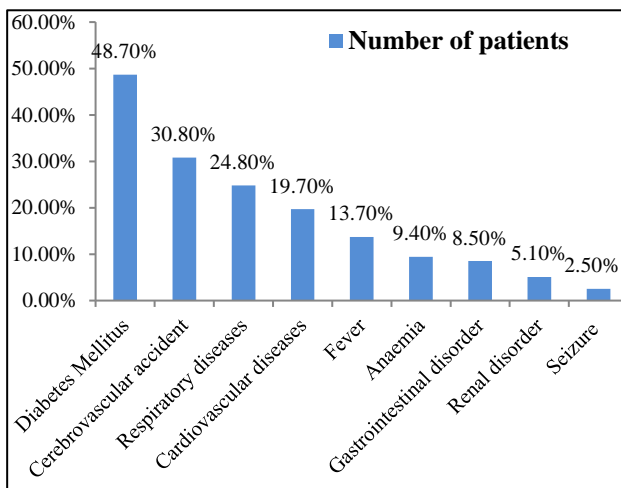


Figure 1: Number of patients with comorbid illness.

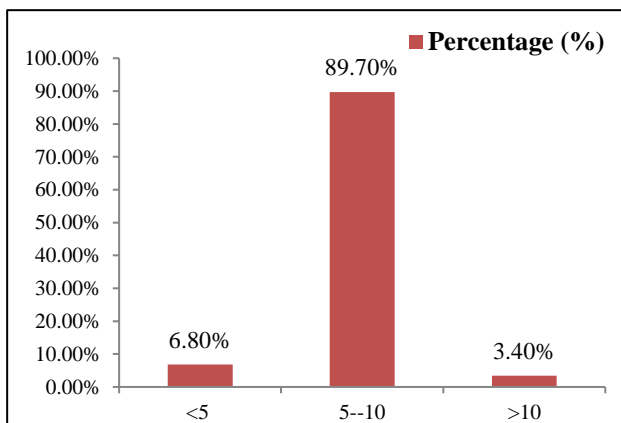


Figure 2: Number of drugs per prescription.

Total of 807 drugs were prescribed in total of 117 prescriptions. Several drugs are prescribed concomitantly since most of the elderly patients present with comorbid

illness. Polypharmacy was seen among 92% of prescriptions, out of 117 prescriptions <5 drugs were used in 6.8%, 5 -10 drugs were used in 89.7% and >10 drugs were used in 3.4% of prescription (Figure 2).

On an average 6 drugs were prescribed per prescription, minimum of 3 drugs or maximum of 14 drugs per prescription were prescribed. Antihypertensive drugs like calcium channel blocker (52.1%), diuretics (42.7%), Angiotensin converting enzyme inhibitors (36.8%), β-blockers (17.1%) and Angiotensin receptor blockers (11.1%) were commonly used (Figure 3).

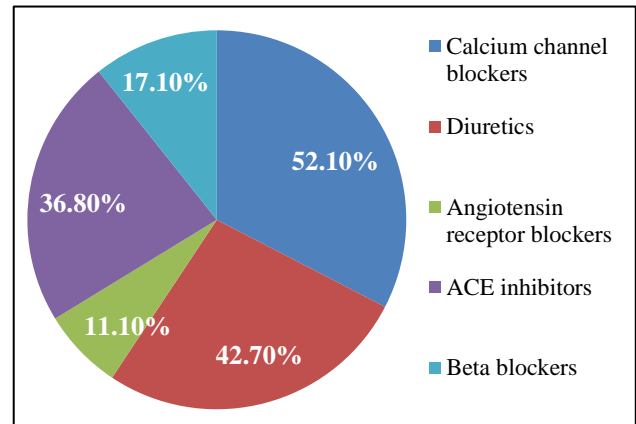


Figure 3: Various categories of antihypertensive drugs prescribed.

Other groups of drugs that were used are GI drugs (17.1%), CVS drugs (12.8%), Antibiotics (11.5%), Respiratory system drugs (8.8%), Antihyperglycaemics (7.3%), Analgesics (5.5%), Vitamins (3.4%), CNS drugs (3.1%), Antihistamines (2.5%), Anticholinergics (0.7%), others (4%) (Table 2).

Table 2: Different groups of drugs used.

Drug group	No. of patients	Percentage (%)
Antihypertensives	189	23.4
Gastrointestinal drugs	138	17.1
CVS drugs	103	12.8
Antibiotics	93	11.5
Respiratory system	71	8.8
Antihyperglycaemics	59	7.3
Analgesics	44	5.5
Vitamins	27	3.4
CNS	25	3.1
Antihistamines	20	2.5
Anticholinergics	6	0.7
Others	32	4
Total	807	100

As per analysis using Beer’s criteria, out of 117 prescriptions 101 were inappropriate. About 68.4% of the prescriptions contained drugs that are to be avoided in

certain disease conditions, 62.4% of prescriptions contained drugs that are to be avoided in elderly, and about 23.9% of prescription drugs showed drug interactions. Aspirin (31.5%) was the commonly used drug among elderly patients with hypertension elderly that has to be avoided (Table 3).

Table 3: Drugs prescribed that are to be avoided in certain disease condition.

Disease	Drugs prescribed that has to be avoided	No. of patients	(%)
Hypertension	Aspirin	35	31.5
CNS disease	Ranitide	20	18
Diabetes	Amlodipine	24	21.6
	β blockers	7	6.3
	Phenytoin	4	3.6
	Steroid	2	1.8
	Thyroid hormone	1	0.9
Kidney disease	Cephalosporins	5	4.5
	Paracetamol	2	1.8
COPD	Furosemide	3	2.7
	Chlorpheniramine	4	3.6
Cor-pulmonale	Atenolol	1	0.9
	Paracetamol	1	0.9
Acid peptic disease	Diclofenac	2	1.8
Total		111	100

Anticholinergic, ipratropium bromide (34.7%) was the commonly prescribed drug among the group of drugs that has to be avoided in the elderly (Table 4).

Table 4: Drugs prescribed that has to be avoided in elderly.

Drugs prescribed that has to be avoided	No. of patients	(%)
Anticholinergics	33	34.7
Ipratropium bromide	27	
Dicyclomine	6	
Proton pump inhibitors	22	23.1
Insulin -sliding scale	15	15.8
NSAID's	10	
Diclofenac	9	10.5
Ibuprofen	1	
Antihistamines	8	8.4
Sedative- hypnotics	7	
Benzodiazepines	6	7.4
Barbiturates	1	
Total	95	100

In our study Deriphylline and Ranitidine were prescribed together, which has shown drug interaction in elderly patients (Table 5).

Table 5: Drug interaction.

Drug interaction that was seen in the study	No. of patients	(%)
Deriphylline + Ranitide	14	46.7
Steroid + NSAID's	10	33.3
Antidepressant (Escitalopram)+ Sedative (zolpidem, Clonazepam) +Tramadol	1	3.3
Antidepressant (Escitalopram)+ Sedative (diazepam)	1	3.3
Tramadol + Chlorpheniramine	1	3.3
Alprazolam+ Prochlorperazine	1	3.3
Phenytoin+ Levetiracetam	1	3.3
Furosemide+ Tamsulosin	1	3.3
Total	30	100

Laboratory derangement was also seen among 94 (80.3%) patients, about 38% patients showed increase in glucose level, decrease in haemoglobin was seen in 36%, about 31% of them showed derangement in renal function test, electrolyte imbalance was seen in about 33% of patients. Adverse health effects like drug induced gastritis, electrolyte imbalance; metabolic dysfunction and renal impairment were seen in few patients because of inappropriate medication.

DISCUSSION

Hypertension is one of the most important treatable non-communicable diseases in elderly population leading to morbidity and mortality. Since elderly patients are associated with multiple chronic diseases several drugs are prescribed concomitantly. Polypharmacy is associated with increased risk for adverse drug reaction as well as drug-drug and drug disease interaction.¹⁴ Inappropriate prescribing in advanced age may be due to altered pharmacokinetic and pharmacodynamics changes as well as age related physiological change in the body composition. lean body mass and total body water decreases with age, with a relative increase in total body fat, which can lead to a decreased volume of distribution for hydrophilic drugs whereas an increased volume of distribution for lipid-soluble drugs.⁵

In our study polypharmacy was seen among 92% of prescriptions. Out of 117 prescriptions <5 drugs were used in 6.8%, 5 -10 drugs were used in 89.7% and >10 drugs were used in 3.4% of prescription. Study conducted by Gopinath S et al showed that 12% of population were 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.¹⁵ Polypharmacy that was seen in our study was mainly due to the comorbid illness in the elderly patient. In our study Antibiotics were prescribed in 79.5%, antiulcer drugs (66.7%), nebulisation (23.9%), ranitidine was commonly

prescribed antiulcer drug. Antihypertensive drugs like calcium channel blocker (52.1%), diuretics (42.7%), Angiotensin converting enzyme inhibitors (36.8%) were commonly used, whereas Gopinath S et al showed in their study that Antibiotics were prescribed in 62.35%, anti-ulcer drugs (61%), anti-anxiety drugs (48%), 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%).¹⁵

Zaveri HG showed in their study that 23.6%, elderly patients received potentially inappropriate prescription of at least one drug.¹¹ In our study inappropriate prescription was seen among 86.3% of elderly patients. Abinash P et al, in their study showed that Cardiovascular disorders (27.65%) were most common, followed by endocrine system disorders (20.16%), infectious diseases such as malaria, pneumonia, etc., (16.57%), and digestive system disorders (11.78%).¹⁶ In our study diabetes mellitus (48.7%) was most common co morbid illness followed by, respiratory diseases (24.8%), cerebrovascular accident (30.8%), cardiovascular diseases (19.7%), fever (13.7%), anaemia (9.4%). According to Chen et al and Oliveria et al studies, the common inappropriately prescribed classes of drug among the elderly are sedative- hypnotics (18.6%) and muscle relaxant (17.5%) followed by antiplatelet agents (10.3%), antihistamines (9.3%), antispasmodics (9.3%) and alpha-blockers (8.2%).¹⁷ In our study Anticholinergics (34.7%) and Antiplatelet (31.5%) drugs were the most commonly prescribed inappropriate drug followed by Proton pump inhibitors (23.1%), NSAID's (10.5%), Antihistamines (8.4%). The extent of treatment and control of hypertension is inadequate among the elderly patient in spite of population being aware of the condition. There is a requirement of rigorous method to examine the prescription appropriateness and their clinical outcomes at larger system and policy levels.¹⁵

Inappropriate prescribing of medicines in elderly people is associated with increased morbidity and mortality, increased cost, and decreased quality of life hence it is one of the major challenges for the prescriber to prescribe safely and effectively among elderly.¹¹ Though the half of the drug consumption is by the elderly population of the society there are no well-designed guidelines for prescribing among elderly which urges a need for rational drug therapy.¹⁸ In order to prevent polypharmacy, healthcare professionals should take utmost care and also should be aware of the risks of inappropriate medication and evaluate all medications at each patient visit.¹⁹

CONCLUSION

Inappropriate prescribing is quite prevalent in general, particularly in elderly patients which needs attention of the health care providers. Use of inappropriate medication among elderly is mainly because of the co morbid illness

associated with the primary disease which leads to polypharmacy. Though efforts are being made to improve the quality of medication prescription among elderly persons, inappropriate prescriptions are common which leads to increased use of healthcare resources and also poor health outcomes among patients. Better actions have to be taken to reduce medication errors and improve the quality of health care for the elderly. A regular review of medication chart by the clinical pharmacist may reduce the polypharmacy and inappropriate medication use and reduce the cost of the therapy and benefit the patients. It is also necessary to improve the geriatric care as this age group possesses risk for more diseases and medication use. Multidisciplinary approach, involving physicians, nurses and pharmacists working as team may help in bringing out rational drug use in geriatric population.

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Ethical approval: The study was approved by the Institutional Ethics Committee of MIMS, Mandya

REFERENCES

1. Joseph TH, Kenneth ES, Christine MR, Morris W. Suboptimal prescribing in older inpatient and outpatient. *JAGS.* 2001;49(2):200-9.
2. Alex ZF, Gordon GL, Dale BC. Inappropriate medication uses and health outcome in the elderly. *JAGS.* 2004;52(11):1934-9.
3. Christine MC. American Geriatrics Society updated Beers criteria for potentially inappropriate medication use in older adults. *J Am. Geriatr. Soc.* 2012;60(4):616-31.
4. Robert LP, Sunny AL, Lucinda LB, Mark JR. Inappropriate prescribing in the hospitalised elderly patient: Defining the problem, evaluation tools and possible solutions. *Clinical Interventions in Aging.* 2010;5:75-87.
5. Situation analysis of the elderly in India. Central statistics office ministry implementation, Govt. of India. 2011.
6. Shyamal KD, Kalyan S, Arindum B. Study of urban community survey in India: growing trend of high prevalence of hypertension in a developing country. *Int. J. Med. Sci.* 2005;2(2):70-8.
7. Raghupathy A, Nanda KK, Hira P, Hassan K, Oscar HFrancoc, Emanuele Di A, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *Journal of Hypertension.* 2014;32:1170-7.
8. Toshio O, Takao S, Hiromi R, Hiroaki M, Kazuaki S, Kazuyuki S. Target Blood Pressure for Treatment of Isolated Systolic Hypertension in the Elderly. *Journal of American heart association.* 2010;56:196-202.
9. Mike M. New guidance covers ways to treat hypertension in elderly patients. *JAMA.* 2011;305(23).
10. Tomas LG, Martin KD, Catherine ED, Deborah JL, George FO, Christopher T. The Beers criteria for

- potentially inappropriate medication use in older adults. American urological Asso.Edu and Research Inc, 2015.
11. Zaveri HG, Mansuri SM, Patel VJ. Use of potentially inappropriate medicines in elderly: A prospective study in medicine out-patient department of a tertiary care teaching hospital. *Indian J Pharmacol*, April 2010;42(2):95-8.
 12. Rima BS, Bharat M, Gajjar, Sagun VD. Evaluation of the appropriateness of prescribing in geriatric patients using Beers criteria and Phadke's criteria and comparison thereof. *J of Phar & Pharmaco.* 2011;2(4):248-52.
 13. Paul G, Denis o'mahony. STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions): application to acutely ill elderly patients and comparison with Beers' criteria. *Age and Ageing.* 2008;37:673-9.
 14. Iftexhar Q, Mrunal SS, Shiney CA, Anjan KN, Sarma PS, Thakappan KR, et al. Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicentre study. *Bulletin of WHO.* 2001;79(6).
 15. Gopinath S, Rajalingam B, SriramS, Subash V. An individual based study of the geriatric population: a polypharmacy. *International Journal of Pharmacy and Pharmaceutical Sciences.* 2011;3(4):63-6.
 16. Supriya P, Abinash P, Meerabai M, Behera JP, Ramani YR, Pradhan PK. A study of the prevalence of potentially inappropriate medication in elderly in a tertiary care teaching hospital in the state of Odisha. *International Journal of Medicine and Public Health.* 2015;5(4):344-8.
 17. Chen LL, Tangiisuran B, Shafie AA, Hassali MA. Evaluation of potentially inappropriate medications among older residents of Malaysian nursing homes. *Int J Clin Pharm.* 2012;34:596-603.
 18. Oliveira MG, Amorim WW, de Jesus SR, Rodrigues VA, Passos LC, Factors associated with potentially inappropriate medication use by the elderly in the Brazilian primary care setting. *Int J Clin Pharm.* 2012;34:626-32.
 19. Poorwa W, Pandit PT, Ghongane BB. Study of prescribing pattern in elderly patients visiting medicine outpatient department at a tertiary care hospital. *Int J Pharm Bio Sci.* 2015;6(4):168-77.
 20. Prakash G, Yalavarthi K, Sharan EJ, Justin J, Shiva Rama Krishna MA. Prospective Study on Medication Prescribing Pattern for Geriatric Patients in a Tertiary Care Teaching Hospital. *Asian Jof Biome and Pharma Sci.* 2015;6(56):23-7.

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