

Challenges in Geriatric Pharmacology

Ajita Khamkar, VM Motghare²

Department of Pharmacology, GMC, Nagpur, India

INTRODUCTION

The geriatric population (age 65 years and above) is on the rise worldwide. This population is vulnerable to many diseases and drug-related problems.¹ India is ageing fast and currently the geriatric population is about seven percent of the total population in the country.²

Conventionally, there are two processes considered to be involved in the aging of a population, aging at the base and aging at the apex of the population. The former results from a decline in fertility while the latter from the mortality reduction among the elderly. In India, both these are recent phenomena. The faster increase in the elderly population will contribute to a higher dependency ratio of the population in the non-productive age group. Also majority of the illiterate elderly had engrossed employment in the unorganized sectors, hence, they would not be covered by social insurance schemes and thus would be in need of economic support. In the absence of support from their relatives, they would have to look towards the government for support.³

Geriatric medicine is branch of gerontology which deals with clinical or medical aspect of gerontology. Generally, elderly in India feel dejected and insecure. The geriatric population is increasing and this population is vulnerable to many diseases and drug-related problems. In India only very limited documented data and studies are available on drug utilization in this population and makes prescribing in elderly difficult.⁴ Some of the important challenges in geriatric prescribing are discussed further.

AGE-RELATED PHYSIOLOGICAL CHANGES AND THEIR PHARMACOKINETIC CONSEQUENCES⁵:

Physiological changes that occur with aging have an impact on the pharmacokinetics and pharmacodynamics of drugs. Absorption from the skin is reduced in the elderly. is shrinkage of liver and hepatic blood flow is reduced. The decreased gastric pH, delayed gastric emptying, reduced splanchnic blood flow, decreased absorptive surface and overall decreased gastric motility can decrease the proper drug absorption though this aspect usually does not result in clinically significant implication.

**Corresponding author: Dr V. M. Motghare, Professor and Head, Department of Pharmacology, GMC, Nagpur, India, Email: vm.motghare@gmail.com*

The body fat is proportionately increased with decrease in lean body mass and total body water. There as the body fat increases in proportion to water and muscle, fat soluble drugs undergo slower elimination. Volume of distribution and half life is increased for the lipid soluble drugs where as plasma concentration is increased for the water soluble drugs.

The major drug binding plasma protein, albumin, is decreased whereas alpha-1 acid glycoprotein is increased, thus free fraction in plasma of acidic drug is increased whereas that of basic drug is decreased.

The hepatic blood flow and hepatic mass is decreased with possibility of impairment of first pass metabolism and phase-I metabolism. Renal function is impaired, glomerular filtration rate is reduced. Renal elimination of drug is compromised because of the decreased blood flow and glomerular filtration rate.

Hence, it is important to monitor drug effects, especially adverse drug reactions, drug interactions and clinical outcome in geriatric patients. There is a need to differentiate the group of overweight and obese elderly from that of frail elderly because multiple disease states will also primarily account for changes in pharmacokinetic and pharmacodynamic properties and this adversely affects the risk/benefit ratio of certain medications. To understand these processes better and in order to make the drug use rational, effective, and safer, it is necessary to study the pattern of drug use in the geriatric group.^{1,4,6,7}

MEDICATION USE IN GERIATRIC POPULATION

Average number of drugs per prescription is

an important index of the scope for review and intervention in prescribing practices. Loss of functional reserve with aging makes geriatric patients vulnerable to the development of multiple diseases affecting different body systems but it is preferable to keep the mean number of drugs per prescription as minimum as possible.

This will help to avoid the drug-drug interactions, development of bacterial resistance and will decrease hospital cost. The consumption of drug among elderly segment of society is been maximum and many of them use at least three prescribed drugs concurrently, one of the plausible explanation for usage of large number of medicines is prevalence of co-morbidities.^{4,8}

POTENTIALLY INAPPROPRIATE MEDICATIONS

The use of inappropriate medications, defined as medications in which risk outweighs the benefit, is a major factor influencing the likelihood of adverse drug events among the elderly.

Since 1991, Beers and colleagues have developed a comprehensive set of explicit criteria for inappropriate medication use, with the intent of providing a helpful tool for assessing the quality of prescribing in older persons. The STOPP (Screening Tool of Older Persons' Potentially Inappropriate Prescriptions) and START (Screening Tool to Alert Doctors to Right Treatment) criteria address some of these concerns.^{10,11,12,13} These lists can be used to identify red flags that may require intervention, not as the final word on medication appropriateness but to provide an idea of the total patient picture.^{9, 14}

POLYPHARMACY

Elderly patients use more medications than younger patients because they have more symptoms and more diseases. Four of every five elderly patients have at least one chronic illness and experience a vast array of symptoms.¹⁵

Considering the adverse outcomes associated with polypharmacy, like adverse drug events, drug–drug interactions, increased cost of medications, increased risk of hospitalization, non-compliance and various medication errors, polypharmacy must be viewed seriously and steps must be taken to reduce it.¹⁶ Healthcare providers must attempt to reduce the number of medications in elderly patients but not be at the expense of eliminating essential medications necessary to improve their quality and duration of life.¹⁷

SOCIO-ECONOMIC RELEVANCE

Elderly people who belong to middle and higher income groups are prone to develop obesity and its related complications due to a sedentary lifestyle and decreased physical activity. The rapid urbanization and societal modernization has led to a breakdown in family values and the framework of family support, economic insecurity, social isolation leading to a host of psychological illnesses. The socio-economic problems are further aggravated by factors such as the lack of social security and inadequate facilities for health care, rehabilitation and recreation.¹⁷

CONCLUSION

Pharmacokinetic variations, adverse drug reactions, drug- drug interactions, irrational prescribing, polypharmacy and use of

potentially inappropriate medications are prevalent among elderly and to prevent this, specific geriatric oriented pharmacological education is needed among doctors and medical students. There is limited availability of data on the vulnerability of elderly towards different disease conditions and drug-related

problems. Physicians, families, pharmacists, nurses, therapists and policy makers should work together to reduce irrational prescribing through targeted approaches and continuing medical education.

REFERENCES

1. Nayaka SR, Rajeshwari B, Venkatadri T V. Drug utilization pattern in geriatric inpatients of medicine department in a Tertiary Care Teaching Hospital. *Int J Basic Clin Pharmacol* 2015;4:568–73.
2. Shahet SN. *API Textbook of Medicine* 1578-80 p.
3. Chanana BHB, Talwar PP. Aging in India: Its Socio- economic and Health Implications. *Asia-Pacific Popul J* 2000;2:3.
4. Jafarin L, Naveen V, Udhayalakshmi T, Jayapriya B. Drug utilization patterns of Geriatric patients admitted in the Medicine Department of a Tertiary Care Hospital. *Int J Pharm Life Sci* 2013;4:3087–92.
5. Klotz U. Pharmacokinetics and drug metabolism in the elderly. *Drug Metab Rev* 2009;41:67–76.
6. Bates DW. Drugs and adverse drug reactions: how worried should we be? *JAMA*. 1998;279(15):1216–7.
7. Daniel Everitt JA. Drug prescribing for the elderly. *Arch Intern Med* 1986;146:2393–6.
8. Straand J, Sandvik H, Rokstad K. Elderly patients in general practice: diagnoses, drugs and inappropriate prescriptions. A report from the More & Romsdal Prescription Study. *Nor J Epidemiol* 1998;8:121–6.
9. Onder G, Landi F, Cesari M, Gambassi G, Carbonin P, Bernabei R. Inappropriate medication use among hospitalized older adults in Italy: results from the Italian Group of Pharmacoepidemiology in the Elderly. *Eur J Clin Pharmacol* 2003;59:157–62.
10. Beers M, Ouslander J, Rollinger I, Reuben D, Brooks J BJ. Explicit criteria for determining inappropriate medication use in nursing home

- residents. UCLA Division of Geriatric Medicine. Arch Intern Med 1991;151:1825–32.
11. Beers M. Explicit criteria for determining potentially inappropriate medication use by the elderly. An update. Arch Intern Med 1997;157:1531–6.
 12. Stuck AE, Beers MH, Steiner A, Aronow HU, Rubenstein LZ, Beck JC. Inappropriate Medication Use in Community-Residing Older Persons. Arch Intern Med 1994;154:2195–200.
 13. Gallagher PF, Barry PJ, Ryan C, Hartigan I, O'Mahony D. Inappropriate prescribing in an acutely ill population of elderly patients as determined by Beers ' Criteria. Age Ageing 2008;37:96–101.
 14. Gallagher P. STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions): application to acutely ill elderly patients and comparison with Beers ' criteria. Age Ageing 2008;37:673–9.
 15. Kovar MG. Health of the elderly and use of health services. Public Health Rep 1977;92:9–19.
 16. Scharlach AE, Mor-barak ME, Katz A, Birba L, Garcia G, Sokolov J. Generation: A Corporate-Sponsored Retiree Health Care Program. Gerontologist 1992;32:265–9.
 17. Ingle G, Nath A. Geriatric Health in India: Concerns and Solutions. Indian J Community Med 2008;33:214–8.