

## Drug utilization pattern in geriatric inpatients of medicine department in a Tertiary Care Teaching Hospital

Swapna R. Nayaka\*, B. Rajeshwari, T. V. Venkatadri

Department of Pharmacology,  
MVJ Medical College &  
Research Hospital, Hoskote,  
Bengaluru, Karnataka, India

**Received:** 31 March 2015

**Revised:** 28 April 2015

**Accepted:** 10 May 2015

**\*Correspondence to:**

Dr. Swapna R. Nayaka,  
Email: drsappy.chinni@gmail.com

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### ABSTRACT

**Background:** The objective of present study was to assess the drug utilization pattern among the geriatric patients.

**Methods:** Totally, 150 prescriptions of patients'  $\geq 65$  years admitted in the medicine inpatient department of MVJ Medical College and Research Hospital, Hoskote were noted from September 2013 to March 2014 and demographic profile, drug utilization pattern, commonly used drugs as per anatomical therapeutic chemical classification (ATC) and WHO core indicators were assessed after taking informed consent from the patients.

**Results:** Out of 150 patients, average age of geriatric patients was 66.83 years with female preponderance (59%). Maximum number of patients were having respiratory disorders (66.67%) followed by diabetes mellitus (35.3%), and cardiovascular diseases (32.67%). 76% patients had co-morbid diseases like diabetes mellitus (n=53), hypertension (n=49), and chronic obstructive pulmonary disease (n=41). A total of 849 drug formulations, containing 1050 active ingredients, were prescribed with average number of 7 (1050/150) drugs per prescription. Only 70 formulations were prescribed by their generic names, which is less than that prescribed by their brand names 779 and total of 146 (17.19%) drugs were prescribed as fixed dose combinations. Only 45.47% drugs were according to WHO Essential Medicines List. Drugs acting on respiratory system (n=189) were the most commonly used drugs in our study followed by drugs acting on the gastrointestinal system (n=130), antimicrobials (n=113), cardiovascular system (n=112), endocrine (n=83), and nutritional supplements (n=72). Polypharmacy was prevalent in 62% and about 22.67% of patients received  $< 5$  drugs. Pantoprazole was most frequently prescribed drug followed by aspirin 75 mg, adrenergic, and anticholinergic bronchodilators.

**Conclusion:** Thus, irrational prescribing and polypharmacy were prevalent among elderly. Drug utilization data can help in assessing the quality of care given to the geriatric patients and promote rational use of medicines.

**Keywords:** Drug utilization pattern, Anatomical therapeutic chemical code, WHO Essential medicine list

### INTRODUCTION

Drug utilization research has been defined by the World Health Organization (WHO) in 1977 as "study of marketing, distribution, prescription and use of drugs in society with special emphasis on the resulting medical and socioeconomic consequences."<sup>1,2</sup> Drug utilization research may provide insights into different aspects of drug use and drug prescribing, such as pattern, quality, determinants, and outcome of drug use.

The consumption of drug among elderly segment of society is been maximum and many of them use at least three prescribed drugs concurrently,<sup>3-5</sup> one of the plausible

explanation for usage of large number of medicines is prevalence of co-morbidities.<sup>6</sup>

Considering the physiological changes that occur with aging and its impact on the pharmacokinetics and pharmacodynamics of drugs, it is essential to monitor drug effects, especially adverse drug reactions (ADR), drug interactions, and clinical outcome in geriatric patients.<sup>7</sup> As the number of medicines taken and the incidence of ADR is more in this age-group, it becomes increasingly important to study patterns of drug use. 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.

As very few studies on drug utilization in geriatric patients are available for these reasons we undertook the present study with the broad aim of understanding the pattern of drug use, sociodemographic characteristics, morbidity pattern, associated comorbidities, commonly prescribed medications according to WHO-ATC classification in geriatric patients.

**Aims and objectives**

The aim of this descriptive study was to analyze general medication utilization patterns in geriatric patients in a rural tertiary care teaching hospital.

1. Analysis of patients details
2. Analysis of drugs used
3. Medications prescribed according to WHO-ATC classification.

**METHODS**

A prospective observational study was undertaken from September 2013 to March 2014 in MVJ Medical College and Research Hospital, a rural tertiary care teaching hospital, Hoskote.

**Sample size**

A total of 150 patients in the geriatric age group ( $\geq 65$  years), from the inpatient Departments of Medicine of MVJ Medical College and Research Hospital, Hoskote were included in the study.

**Criteria for inclusion of participant's**

Patients of either gender who had completed 65 years of age on 31<sup>st</sup> July, 2013, or earlier and who were admitted to the wards of medicine department and who give informed consent were included in the study.

**Exclusion criteria**

Patients who are unwilling to participate in the study, seriously ill requiring intensive care unit admissions or on ventilators and those who were unable to communicate were excluded.

After evaluating the patient for inclusion and exclusion criteria those who gave informed consent were visited daily in their respective ward during their hospital stay and interviewed and their case record sheets were reviewed for gathering the necessary information and entered in a pre-structured case record form:

1. Analysis of patients details
  - Socio demographic details (age, gender, literacy, and socioeconomic status)

- Main diseases suffered from as well as co-morbid conditions.
2. Analysis of drugs used
    - Total number of drugs prescribed (including the number of ingredients in multidrug formulation)
    - Average number of drugs per prescription
    - Use of fixed-dose combinations (FDC)
    - Drugs prescribed by generic name or brand name
    - Patients were divided into three categories based on number of drugs prescribed per day
      - a. <5 medicines per day
      - b. 5-10 medicines per day
      - c. >10 medicines per day.

For this study, 5-10 drugs per day is considered as "Polypharmacy" and >10 drugs per day considered as "high polypharmacy".

**Statistical analysis**

The data were subjected to descriptive analysis using Microsoft Excel. Drugs were classified according to the WHO-ATC classification and verified by WHO Essential Medicine List (EML) as well as National List of Essential Medicines (NLEM) 2011. Different parameters were given as a percentage.

**RESULTS**

Total 150 geriatric patients who were admitted in medicine ward were included in the study and different data were used to assess sociodemographic profile, commonly prescribed as per anatomical therapeutic chemical classification (ATC) and WHO core indicator, most commonly used drugs and co-morbid conditions.

Average age of geriatric patients was 66.83 years with female preponderance and a detail about sociodemographic characteristics of patients has been described in Table 1.

**Table 1: Sociodemographic data of the geriatric patients.**

Sociodemographic parameters	Characteristic group (%)
Age	Male: 62 (41)
	Female: 88 (59)
Literacy	Illiterate: 93 (62)
	Upto 10 <sup>th</sup> : 36 (24)
	Upto 12 <sup>th</sup> : 07 (4.7)
	Graduate: 10 (6.7)
	Postgraduate: 04 (2.7)
Socioeconomic status	Lower middle class: 102 (68)
	Middle class: 30 (20)
	Upper middle class: 18 (12)

The five most common conditions for admission were respiratory diseases (chronic obstructive pulmonary disease [COPD] - 41%), diabetes mellitus (35.33%), hypertension (HTN) (49%), gastrointestinal diseases (GE - 14.79%), and cerebrovascular accidents (10%) (Table 2). Multiple systems were involved in 76% patients, and most common co-morbid diseases were diabetes mellitus in 53 patients, HTN in 49 patients, and COPD in 41 patients. The number of comorbidities in patients is depicted in Figure 1.

A total of 849 drug formulations containing 1050 active ingredients were prescribed to the study population. Of the 849 formulations, 703 (82.80%) contained only one active ingredient, while 146 (17.19%) were FDCs. A large number (779: 91.75%) of drugs were prescribed by their brand names and only 70 (8.24%) were prescribed by their generic names. Average number of drugs per prescription was 7 and only 22.67% patients were prescribed <5 drugs, 62% of patients were prescribed 5-10 drugs fall in polypharmacy, and 6% patients had high polypharmacy. WHO-Core indicators listed in Table 3.

The category-wise distribution of drugs prescribed is shown in Figure 2. Drugs acting on the respiratory system (n=189)

were the most frequently prescribed drugs, followed by drugs acting on the gastrointestinal system (n=130), antimicrobials (n=113), Cardiovascular system (n=112), endocrine (n=83), and nutritional supplements (n=72). Together these drugs accounted for nearly (66.57%) of the total drugs in this study.

Total 849 drugs were prescribed in all the cases with 26.38% parenteral, 58.54% oral, and 15% other formulations. Total 207 different types of drugs were prescribed by generic (48.79%) and brand (51.21%) names. Total 463 (54.53%) and 386 (45.47%) drugs were prescribed from National and WHO Essential Drug Lists, respectively. Major drugs according to WHO-ATC classification of each class as found in our study has been explained with the help of Table 4.

**DISCUSSION**

The geriatric population is on the rise worldwide. This population is vulnerable to many diseases and drug-related problems. Limited data are available in general, and in India in particular, on drug utilization in this population.

**Table 2: Disease conditions prevalent in geriatric patients.**

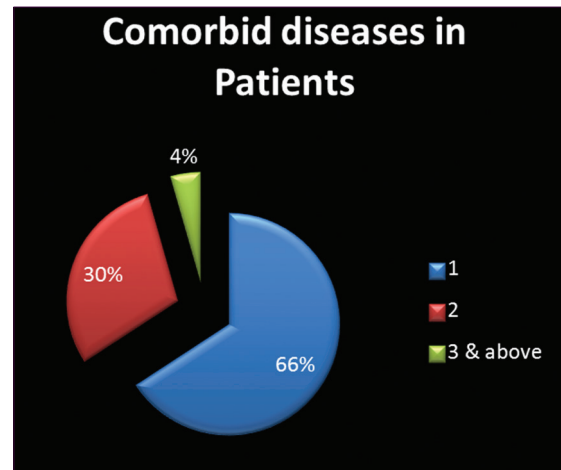
Diseases	Number of patients (percentage of patients who suffered from particular disease)
Respiratory diseases	100 (66.67)
Cardiovascular diseases	49 (32.67)
Endocrinal diseases (diabetes)	53 (35.33)
CNS diseases	15 (10)
GIT diseases	23 (15.33)
Renal diseases	4 (2.67)
Hepatic diseases	6 (4)
Blood disorders	7 (4.67)
Others	7 (4.67)

GIT: Gastrointestinal tract, CNS: Central nervous system

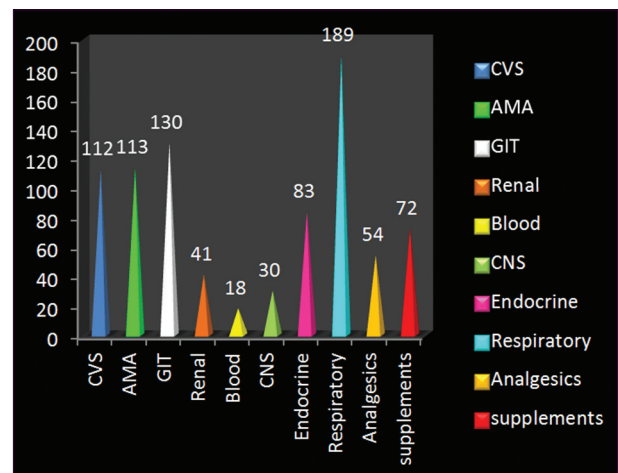
**Table 3: WHO-CORE indicators.**

CORE indicators	Result
Total number of drugs with active ingredients in FDCs	1050
Average number of drugs per prescription	7
Drugs prescribed as FDC (%)	146 (17.19)
Total encounters having injectable preparations (%)	224 (26.38)
Drugs prescribed by generic name	70
Drugs prescribed by brand name	779

FDCs: Fixed dose combinations



**Figure 1: Co-morbid conditions in patients.**



**Figure 2: Drugs used in geriatric patients.**

**Table 4: Drugs used in detail according to WHO-ATC classification.**

Drug class	Drug name	Number of prescriptions (%)	ATC code	Dosage form
Cardiovascular drugs	Aspirin	32 (21.33)	B01AC06	Oral
Nutritional supplements	B Complex	47 (31.33)	A11EA	Oral
Antibiotics	Ceftriaxone	32 (21.33)	J01DA13	Parenteral
Multivitamin	Other minerals+ combinations	20 (13.33)	A11AA03	Oral
Bronchodilators	Adrenergic and anticholinergic	55 (36.67)	R03AL	Inhalation
Bronchodilators	Theophylline	38 (25.33)	R03DA04	Oral, parenteral
Analgesics	Paracetamol	40 (26.67)	N02DE01	Oral
Cough and cold preparations (R05)	Bromhexine	12 (8)	R05CB02	Oral
Antacid	Pantoprazole	78 (52)	A02BC02	Oral
Ant diabetic drugs	Metformin	21 (14)	A10BA02	Oral

ATC: Anatomical therapeutic chemical

We undertook this study in order to understand the pattern of drug use and related issues in geriatric patients.

In this study, records of 150 patients were analyzed. Out of which (59%) were females and (41%) were males which are similar to other studies,<sup>8-13</sup> where number of females is more than males. Average age of geriatric patients was 66.83 years whereas in a study by Jhaveri et al.<sup>14</sup> average age was 72.69 years. 93% of patients were illiterate and 102 (68%) belonged to category of lower and only 18 (12%) to higher socioeconomic classes compared to study by Shah et al.<sup>15</sup> where 65.5% of the patients had basic education (10th standard and above) and 86.5% were from the lower and middle socioeconomic strata.

The morbidity pattern in these patients was quite similar to what is commonly found in Indian geriatric patients. The common morbidities included respiratory conditions like COPD, diabetes mellitus, cardiovascular disease like HTN and CCF, and disorders of gastrointestinal tract system like gastroenteritis. The majority of patients (114) in our study had comorbid conditions as depicted in Figure 1 where 66% had single comorbid disease in comparison with other study by Sharma et al.,<sup>16</sup> where 38% had 3 comorbid conditions together. Loss of functional reserve with aging makes geriatric patients vulnerable to the development of multiple diseases affecting different body systems. The presence of comorbidities means that multiple and complex drug therapy is required, and thus the chances of ADRs and drug interactions are greater.

In this study, a total of 150 prescriptions were studied and WHO core indicators were assessed as explained in Table 3. Average number of drugs per prescription is an important index and should be kept as low as possible.<sup>17</sup> Average number of drugs per prescription was 7 (1050/150) which shows polypharmacy while it was 5.51 (1296/235) in Sharma et al.<sup>16</sup> study and 5 in another study in Brazil.<sup>18</sup> The reason for polypharmacy in geriatric patients is coexistence of more than one comorbid conditions. Considering the adverse outcomes

associated with polypharmacy, including adverse drug events, drug-drug interactions, increased cost of medications and/or treatment, increased risk of hospitalization, patient non-adherence with treatment (which increases with complex regimens), and various medication errors, we need to take appropriate measures for minimizing polypharmacy.

Total 849 drug formulations were prescribed to 150 patients for different diseases. Of these drug formulations, only 17.19% were FDCs, which is less compared to 25% FDCs in Sharma et al. 2013.<sup>16</sup> FDCs increase the risk of drug interactions and ADRs. Moreover, they cause difficulty in titrating dose of a particular drug as it is not possible to increase or decrease the dose of an individual ingredient alone. The use of FDCs can improve compliance with therapy by decreasing the number of formulations to be taken, but their benefit/risk ratio should be assessed before they are prescribed. However, considering that the number of FDCs in India, which is around 60% of all available formulations<sup>19</sup> the use of FDCs in our institution, is relatively low, reflecting the rational use of medicines.

We found that, drugs prescribed by generic names were 70 (8.24%) less than that prescribed by their brand names 91.75% other studies from India have reported generic prescribing to the extent of 38.85%<sup>20</sup> and 43.9%,<sup>21</sup> which is higher than that in our study. Very few studies have been conducted focusing on this aspect of drug prescribing. These findings clearly indicate that there is a need to encourage prescribing by generic names, particularly in hospitals attached to medical colleges and by all doctors in the present Indian scenario.

We identified the most frequently prescribed drugs in this study. Pantoprazole (A02BC02) was found to be the most frequently prescribed drug. This coincides with the findings of other studies from India, which have also shown highest use of Group A (alimentary and metabolism) drugs according to the ATC classification system.<sup>22</sup> Though it is the most frequently prescribed drug, the prevalence of gastrointestinal

diseases was very low in our study. Interestingly, a Brazilian study<sup>18</sup> has also reported Group A (ranitidine) as one of the most frequently prescribed medicines despite the low prevalence of gastrointestinal conditions. This shows that the irrational use of Group A drugs is common.

The next most frequently used drugs were found to be aspirin (in antiplatelet doses, B01AC06). Their large-scale use can be explained by the high prevalence of cardiovascular diseases. In the present study, vitamin B complex (A11EA) was used in 47 (31.33%) patients; this can perhaps be considered as nutritional supplement in geriatric patients<sup>23</sup> very few indications exist for its therapeutic use. Though preparations of either vitamin B complex or multivitamins have not found a place in the WHO-EML so far, multivitamin preparations are listed in the NLEM of India (2011). ACE inhibitors and ARBs were the most frequently prescribed drug group for HTN in our study in comparison to study done in Ahmedabad,<sup>24</sup> calcium channel blockers were frequently used, though recent guidelines suggest that thiazide diuretics should be the drugs of first choice for treatment of HTN in elderly with calcium channel blockers being the drugs of second choice.<sup>23</sup> Drugs according to WHO-EML<sup>25</sup> were 386 while on NLEM<sup>26</sup> was 463 similar to Rathnakar et al., which had high prevalence of NLEM drugs used.<sup>27</sup>

This study has generated data on the various diseases prevalent in Indian geriatric patients and given an overview of general drug utilization among them instead of focusing on one disease or a specific class of drugs only. As there has not been any similar earlier study in the Indian setting, we believe that our study is innovative in nature and that our findings provide baseline data for comparison with the findings of similar studies in future. Though this study has not focused on the morbidity pattern of a specific disease or the usage pattern of a particular category/class of drugs in Indian geriatric patients, it may pave the path for future larger-scale studies of a similar nature.

## CONCLUSION

Irrational prescribing and polypharmacy are prevalent among elderly and to prevent this specific gerontopharmacological education is needed to be inculcated among medical students. There is a scarcity of data on the vulnerability of elderly toward different disease conditions and drug-related problems. This study has shown the patterns of medical diseases prevalent in geriatric patients and drug use among them and has also provided useful baseline data. Drug utilization studies of this type may ultimately help in improving the quality of healthcare given to the geriatric patients.

## Limitations

The number of patients and duration of the study is relatively small. These can be considered as limitations of our study

but, nevertheless, the study findings cannot be considered any less important.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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doi: 10.18203/2319-2003.ijbcp20150042

**Cite this article as:** Nayaka SR, Rajeshwari B, Venkatadri TV. Drug utilization pattern in geriatric inpatients of medicine department in a Tertiary Care Teaching Hospital. *Int J Basic Clin Pharmacol* 2015;4:568-73.