

RESEARCH ARTICLE

Drug utilization pattern in geriatric inpatients of Medicine wards at a government tertiary care hospital

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Received: January 18, 2019; Accepted: February 07, 2019

ABSTRACT


Background: Drug utilization pattern in geriatric population is an area of research where very few studies are done and this study was undertaken to evaluate the drug utilization pattern among geriatric inpatients of medicine wards at a tertiary care teaching hospital. **Aims and Objectives:** This study aims to study the drug utilization pattern in geriatric inpatients of medicine wards at a government tertiary care hospital. **Materials and Methods:** A prospective observational study including 300 geriatric inpatients admitted to medicine wards was conducted from October to December 2017. Relevant details were collected from case files of the patients and entered into a predesigned pro forma and data were analyzed. **Results:** Majority of the patients were between the ages of 60 and 69 years (60.7%). There was male preponderance (57.3%). Respiratory disorders were the most common (35.3%) followed by central nervous system and CVS disorders (21.7% each). A total of 1720 drug formulations were prescribed, of which 171 (9.94%) were fixed-dose combinations. 70.32% and 73.07% of the drugs were included under the World Health Organizations essential medicines list and the national list of essential medicines, respectively. Antimicrobials were the most commonly prescribed drugs (19.4%) followed by drugs acting on gastrointestinal system (17.6%), drugs acting on cardiovascular system (12.6%), vitamins, minerals, and supplements (9.4%), drugs acting on hematological system (8.5%), and drugs acting on respiratory system (7.6%). Ranitidine was the most frequently prescribed drug followed by ceftriaxone and paracetamol. Average number of drugs prescribed per encounter was 6.7. Percentage of drugs prescribed by generic name was 43.5%. **Conclusion:** Drug utilization data can help in assessing the quality of care given to patients; promote rational use of medicines by helping to improve prescribing patterns.

KEY WORDS: Drug Utilization Pattern; Geriatric Patients; World Health Organization Prescribing Indicators; Essential Medicines List

INTRODUCTION

Drug utilization research has been defined by the World Health Organization (WHO) in 1977 as “the study of

marketing, distribution, prescription, and use of drugs in society, with special emphasis on the resulting medical, economic, and social consequences.”^[1] Drug utilization research may provide insights into different aspects of drug use and drug prescribing, such as pattern of use, quality of use, determinants of use, and outcome of drug use.^[2] Drug utilization study forms an important component of many research studies which aim to examine clinical as well as economic effectiveness of pharmacotherapy. Medication prescription habits and the use of medications are to be monitored and strategies ought to be recommended for containing the medication cost.

Access this article online	
Website: www.njppp.com	Quick Response code 
DOI: 10.5455/njppp.2019.9.0102607022019	

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In India, the size of elderly population, i.e., persons above the age of 60 years is fast growing although it constituted only 7.4% of total population at the turn of new millennium. This segment of population faces multiple medical and psychological problems.^[3]

The consumption of drugs among elderly segment of society has been maximum and many of them use at least three prescribed drugs concurrently, one of the plausible explanations for the usage of large number of medicines being the prevalence of comorbidities.^[2] As the number of medicines taken by geriatric patients and the incidence of adverse drug reactions (ADRs) is more in this age group, it becomes increasingly important to study patterns of drug use. With the alteration of pharmacokinetics and pharmacodynamics of many drugs with advancing age,^[4] it is essential to monitor drug effects, especially ADRs, drug interactions, and clinical outcome in geriatric patients.^[5]

Previous studies have revealed that due to exclusion of frail elderly from clinical trials, knowledge about the efficacy and safety of many drugs is often sparse.^[4] As the number of medicines taken and the incidence of ADRs is more in this age group, it becomes increasingly important to study patterns of drug use.^[2]

Very few studies on drug utilization in geriatric patients are available, especially in India.^[6] Keeping this in mind, the study was done with the broad aim of understanding the pattern of drug use, sociodemographic characteristics, morbidity pattern, associated comorbidities, and commonly prescribed medications according to the WHO - Anatomical Therapeutic Chemical (ATC) classification system in geriatric patients. Understanding the pattern of drug use in geriatric patients and the influence of factors such as age, gender, and associated comorbidities on drug prescribing in geriatric patients will provide useful data for prescribing in the elderly.

MATERIALS AND METHODS

Setting and Study Design

A prospective observational study was conducted over a period of 3 months from October to December 2017 in Medicine wards of Mandya Institute of Medical Sciences (MIMS), Mandya, after obtaining the Institutional Ethics Committee clearance (MIMS/IEC/RP/2017/182). MIMS is a government tertiary care teaching hospital which caters to the needs of a large patient pool from both urban and rural areas. All patients admitted to male and female medical wards are attended by specialists in the general medicine department for management.

Study Population

Geriatric inpatients of both genders, aged 60 years and above admitted to medicine wards, who stayed for >24 hours were included in the study. Exclusion criteria were outpatients,

patients admitted to intensive care unit and emergency wards, and medicolegal cases.

Estimated sample size was 240 case records based on proportion of subjects staying for >24 hours to total admissions in medicine ward. A total of 300 prescriptions were analyzed. Complete prescriptions were recorded in predesigned case record form. Case records of subjects were also looked into to collect pertinent patient details as required by the study. Demographic data such as age, gender, and place of residence were noted. The clinical data comprising diagnosis, names of the drugs, and their route of administration were recorded. Confidentiality of the study subjects was maintained. The data thus obtained were analyzed to arrive at the WHO core prescribing indicators mentioned below.

The WHO has compiled a set of core drug use indicators that are useful for studying patterns of drug prescribing in health-care facilities.

The WHO core prescribing indicators:^[7]

- Average number of drugs per prescription.
- Percentage of prescription with antibiotics.
- Percentage of prescription with injection.
- Percentage of drugs prescribed by generic names.
- Percentage of drugs prescribed from the essential drug list (or formulary).

The 19th WHO model list of Essential Medicines^[8] (April 2015) and Indian National List of Essential Medicines (NLEM)^[9] (2015) were used in our study.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed. Descriptive statistics such as mean for continuous variables and frequency and percentage for categorical variables were determined.

RESULTS

Analysis of Drug Utilization Pattern

A total of 300 case records of geriatric patients, both male and female, who were admitted in medicine wards were scrutinized. 182 (60.7%) patients were between the age group of 60 and 69 years, 86 (28.7%) patients belonged to the age group of 70–79 years, and 32 (10.7%) patients were aged 80 years and above. Among the cases reviewed, 172 (57.3%) were male and 128 (42.7%) were female [Table 1]. Majority of the patients were admitted for a duration of 2–5 days (61.7%) followed by hospital stay of 5–10 days (32.7%) [Figure 1]. The most commonly involved target organ system which necessitated the need for admission was respiratory system (35.3%) followed by neurological (21.7%) and cardiovascular systems (21.7%). The rest of the cases

Table 1: Demographic characteristics of patients

Demographic characteristic	Number	Frequency (%)
Age (years)		
60–69	182	60.7
70–79	86	28.7
>80	32	10.7
Total	300	
Gender		
Male	172	57.3
Female	128	42.7
Total	300	
Residence		
Urban	102	34.0
Rural	198	66.0
Total	300	-

Table 2: Distribution of various target organ systems involved

Target organ system (disease conditions)	Number of patients	Frequency (%)
Respiratory system	106	35.3
Neurological system	65	21.7
Cardiovascular system	65	21.7
Gastrointestinal system	30	10.0
Endocrine system	12	4.0
Infectious disorders	3	1.0
Renal system	2	0.7
Hepatobiliary system	1	0.3
Others	16	5.3
Total	300	-

belonged to other organ systems as mentioned in Table 2. The frequency of the number of associated comorbid conditions is given in Figure 2. Majority of the patients had at least one associated comorbidity (52%).

A total of 1720 drug formulations were prescribed to the study population. Most of the drugs prescribed were antimicrobial agents (21.39%) followed by drug acting on cardiovascular system (14.41%). The remainder of the drugs acting on other organ systems is given in Table 3. Among the antimicrobial agents, ceftriaxone was the most prescribed drug and furosemide was the most commonly prescribed drug for cardiac disorders. The most commonly prescribed parenteral drug was ranitidine which was also the most commonly prescribed drug among the patients (13.31%). Other commonly prescribed drugs acting on various systems are mentioned in Table 4. Next to ranitidine, the most commonly prescribed drug was ceftriaxone (7.5%). Other commonly prescribed drugs were atorvastatin, furosemide, cefotaxime, enalapril, salbutamol, and others. The route of administration and ATC/DDD classification^[10] is given in Table 5.

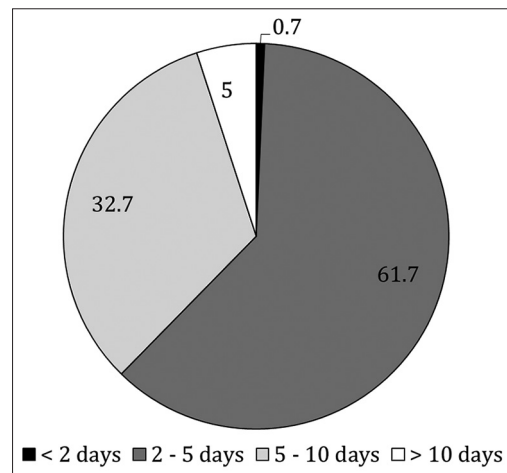


Figure 1: Number of days of hospital stay

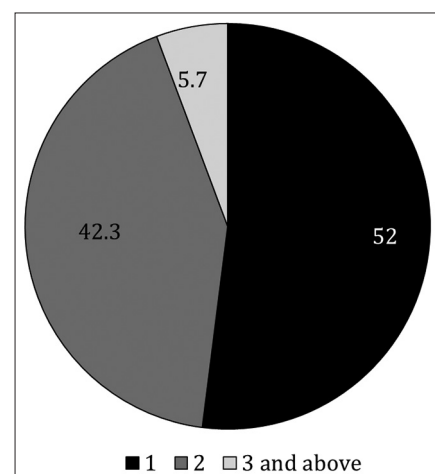


Figure 2: Number of associated comorbid conditions in the study population

Analysis of Prescription Indicators

Analysis of prescription was done using the WHO core prescribing indicators. The average number of drugs prescribed per prescription was 6.7. The minimum and maximum number of drugs prescribed for a single patient was 2 and 14, respectively. Frequency of the number of drugs per prescription is given in Figure 5. Percentage of drugs prescribed by generic name was 43.5%. Percentage of encounters with antibiotics 18.4% and 67.5% of the drugs was prescribed as injectables. 70.32% of drugs were included in the WHO Essential Medicines List (WHO-EML) [Table 6] and 73.07% of drugs were listed in NLEM [Figure 6].

DISCUSSION

In our study, the case records of 300 patients were analyzed. In the study, male subjects were predominant (57.3%) compared to female subjects (42.7%). Majority of the patients belonged to the age group of 60–69 years. The mean duration of admission was 2–5 days for most of the patients. Most of the diseases were chronic in nature which is often the case

in geriatric population. The common morbidities included respiratory conditions like bronchitis, cardiovascular diseases like hypertension, and other conditions like diabetes mellitus. The total number of drugs prescribed for various disease conditions in the study population was 1720. The mean number of drugs per prescription was 6.7 which indicates the high prevalence of polypharmacy in the study population. The average number of medications prescribed per patient according to age groups is given in Figure 3 and the average number of medications prescribed per patient according to gender is given in Figure 4. Of the 1720 drugs prescribed in the study population, those prescribed by generic names were 43.5%. Of the 1720 drugs prescribed, 70.32% of drugs were included in the WHO-EML and 73.07% of drugs were prescribed from NLEM. The most commonly prescribed class of drugs was the antimicrobial agents, ceftriaxone being the most commonly prescribed antibiotic. Percentage of encounters with antibiotics was 18.4%.

Table 3: Category-wise distribution of drugs prescribed

Category of drug	Number of prescriptions	Frequency (%)
Antimicrobial agents	368	21.39
Drugs acting on cardiovascular system	248	14.41
Vitamins, minerals, and supplements	185	10.76
Drugs acting on hematological system	166	9.65
Drugs acting on respiratory system	150	8.72
Analgesic, anti-inflammatory, and antipyretic drugs	130	7.56
Drugs acting on endocrine system	130	7.56
Drugs acting on gastrointestinal system	117	6.8
Drugs acting on nervous system	107	6.22
Drugs acting on hepatobiliary system	23	1.36
Drugs acting on renal system	12	0.7
Other drugs	84	4.88
Total number of prescriptions	1720	

The gender distribution of our study subjects is in accordance with studies conducted by Shah *et al.*,^[6] Nayaka *et al.*,^[2] Binod *et al.*,^[11] Kolhe *et al.*,^[12] and Singh,^[13] where the male patients were predominant. The morbidity pattern and the organ systems affected were also similar to the studies done by others. The common morbidities seen in our study were similar to those from studies conducted elsewhere in India. Majority of patients (114) in our study had comorbid conditions. 66% had a single comorbid disease in comparison with another study by Sharma *et al.*^[4] where 38% had three comorbid conditions. The functional loss with aging of the organ systems explains the vulnerability of elderly population to multiple diseases. The presence of comorbidities also explains polypharmacy and hence the increased prevalence of drug-drug interactions and ADRs.

The total number of drugs prescribed for various disease conditions in the study population was 1720. The mean number of drugs per prescription was 6.7. This is similar to the study that was conducted by Shah *et al.*^[6] where the average number of drugs per prescription was 7.3 and contrary to the studies done by Weiss *et al.*^[14] and Shenoy *et al.*^[15] where the number was 5. Taking into consideration the age group, the high number of patients with associated is not unexpected. Polypharmacy defined by the WHO as “the administration of many drugs at the same time or the administration of an excessive number of drugs” was very much prevalent in our study population. Polypharmacy is a public health issue as well as an economic burden to the nation. It also leads to non-adherence and increased chances of ADRs. Hence, appropriate measures need to be taken to minimize the extent of polypharmacy.

Drugs prescribed by generic names were 43.5% in our study. This is similar to studies where the extent of prescribing by generic medicines was between 38.85% by Zaveri *et al.*^[16] and 43.9% by Shewade *et al.*^[17] The result seen is in contrast to the study was done by Nayaka *et al.*^[2] where the percentage of prescriptions by generic names was 8.24%.

Table 4: Most commonly prescribed drugs under different categories of drugs

Category of drug	Drug	Route	Number of prescriptions	Frequency (%)
Antimicrobial agents	Inj. ceftriaxone	P	129	7.5
Drugs acting on cardiovascular system	Inj. furosemide	P	68	3.95
Vitamins, minerals, and supplements	Cap. B complex	O	40	2.33
Drugs acting on hematological system	Tab. ferrous sulfate	O	35	2.03
Drugs acting on respiratory system	Syp. salbutamol	O	53	3.08
Analgesic, anti-inflammatory, and antipyretic drugs	Tab. paracetamol	O	92	5.35
Drugs acting on endocrine system	Tab. metformin	O	49	2.85
Drugs acting on gastrointestinal system	Inj. ranitidine	P	229	13.31
Drugs acting on nervous system	Inj. mannitol	P	52	3.02
Drugs acting on renal system	Tab spironolactone	O	6	0.35

P: Parenteral, O: Oral, Inj: Injection, Tab: Tablet, Cap: Capsule, Syp: Syrup

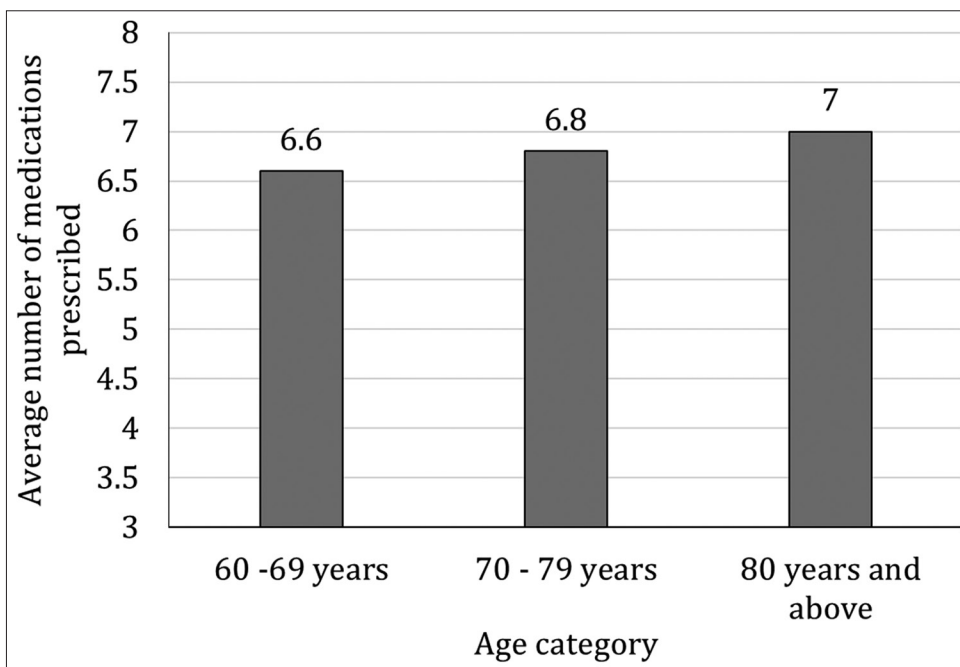


Figure 3: Average number of medications prescribed per patient according to age

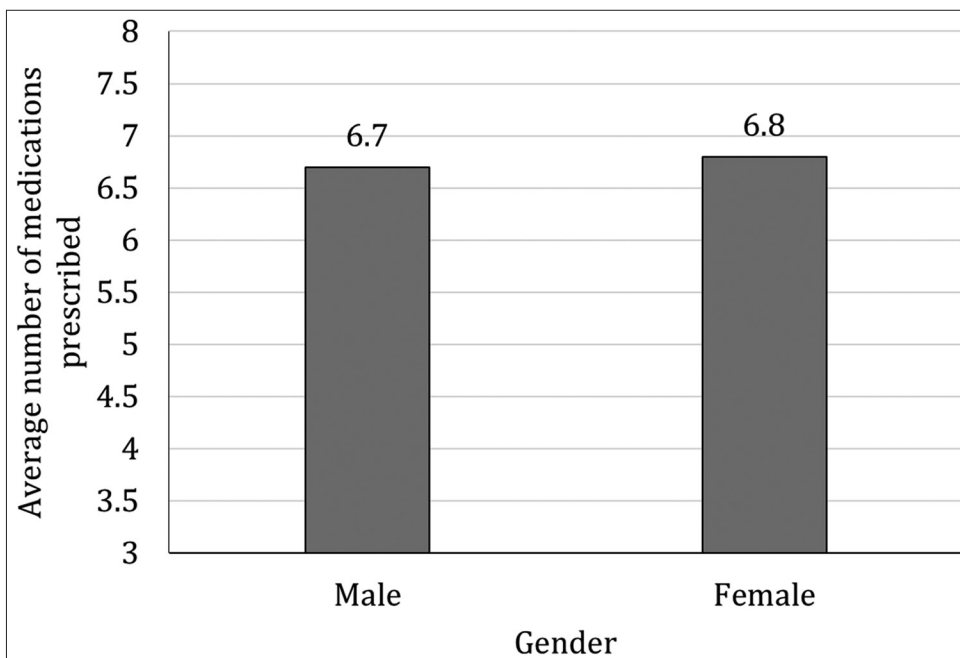


Figure 4: Average number of medications prescribed per patient according to gender

Prescription with generic names ought to be encouraged and the result from our study looks promising. The importance of prescribing using generic names lies in the fact that only generic names are accepted for legal and administrative purposes. It can also help in reducing irrational prescribing. Prescribing by generic name allows flexibility of stocking and dispensing various brands of a particular drug that are cheaper than and as effective as proprietary brands. The trend of prescribing by brand names could be accounted for by the aggressive marketing done by pharmaceutical companies and faulty drug policy at the prescriber level. This can be

brought down by commitment to prescribing only by generic names by doctors all over and measures by legislative and administrative bodies to enforce drug production and prescribing only by generic names.

In our study, 70.32% of drugs were included in the WHO-EML. In the study was done by Shah *et al.*,^[6] percentage of drugs prescribed from the WHO-EML was 51.7%. 73.07% of drugs were prescribed from NLEM. The concept of essential medicines is evidence based, cost-effective, and highly pragmatic in providing the best drug therapy. It emphasizes

on rational use of medicines, and hence, there is a need to educate and encourage doctors to prescribe only essential medicines to the best extent possible. In the study done by Singh,^[13] the drugs prescribed from the WHO-EML and NLEM were found to be 35.73% and 48.38%, and the study

conducted by Sapkota *et al.* found that 55% of drugs were prescribed from the WHO-EML and 75% from NLEM. This indicates that the prescription of essential medicines varies widely depending on the geographic location and the kind of institution providing health care.

Table 5: Most commonly prescribed drugs with ATC code and DDD

Drug	Number (%)	ATC code	DDD (g)	Route
Ranitidine	229	A02BA02	0.3	P
Ceftriaxone	129	J01DD04	2	P
Atorvastatin	88	C10AA05	0.04	O
Furosemide	68	C03CA01	0.04	P
Cefotaxime	57	J01DD01	4	P
Enalapril	55	C09AA02	0.01	O
Salbutamol	53	R03CC02	0.012	O
Ondansetron	52	A04AA01	0.016	P
Mannitol	52	B05BC01	-	P
Budesonide	50	R03BA02	0.0015	Inhal

ATC: Anatomical therapeutic chemical classification, DDD: Defined daily dose, P: Parenteral, O: Oral, Inhal: Inhalational

Table 6: The WHO core drug use prescribing indicators

Prescribing indicator	(%)
Average number of drugs per encounter	6.7
Percentage of drugs prescribed by generic name(%)	43.5
Percentage of encounters with an antibiotic prescribed(%)	18.4
Percentage of encounters with an injection prescribed(%)	67.5
Percentage of drugs prescribed from essential drugs list (WHO-EML)(%)	70.32

WHO-EML: World Health Organization Essential Medicines List

The most commonly prescribed class of drugs was the antimicrobial agents, ceftriaxone being the most commonly prescribed antibiotic. Percentage of encounters with antibiotics was 18.4%. This is in contrast to the study that was done by Singh^[13] where antimicrobials were prescribed to 83.42% of the subjects and 92.57% in the study done by Abraham *et al.*^[18] In the study done by Veena *et al.*,^[19] percentage of antimicrobials prescribed to 16.94%, which was similar to the results obtained from our study. Higher and injudicious use of antibiotics results in antimicrobial resistance and prudent decisions are to be taken while prescribing antibiotics.

The most frequently prescribed drug in our study was ranitidine. This is in line with findings from other studies in India^[6,16] where ranitidine was the most commonly prescribed drug. It is also in accordance with a Brazilian study that was conducted by Braga *et al.*^[20] where ranitidine was the most commonly prescribed drug and also in a study done in Nepal by Shankar *et al.*^[21] Although gastrointestinal disorders were not frequently encountered, ranitidine was commonly prescribed as prophylaxis against gastritis. However, the rationale of its prescription is questionable. The next most frequently prescribed drug was ceftriaxone. Other drugs frequently prescribed were atorvastatin, furosemide, cefotaxime, enalapril, and salbutamol. The results are similar to the results from other Indian studies like the one done by Jadhav *et al.*^[22] where cardiovascular group of drugs was one

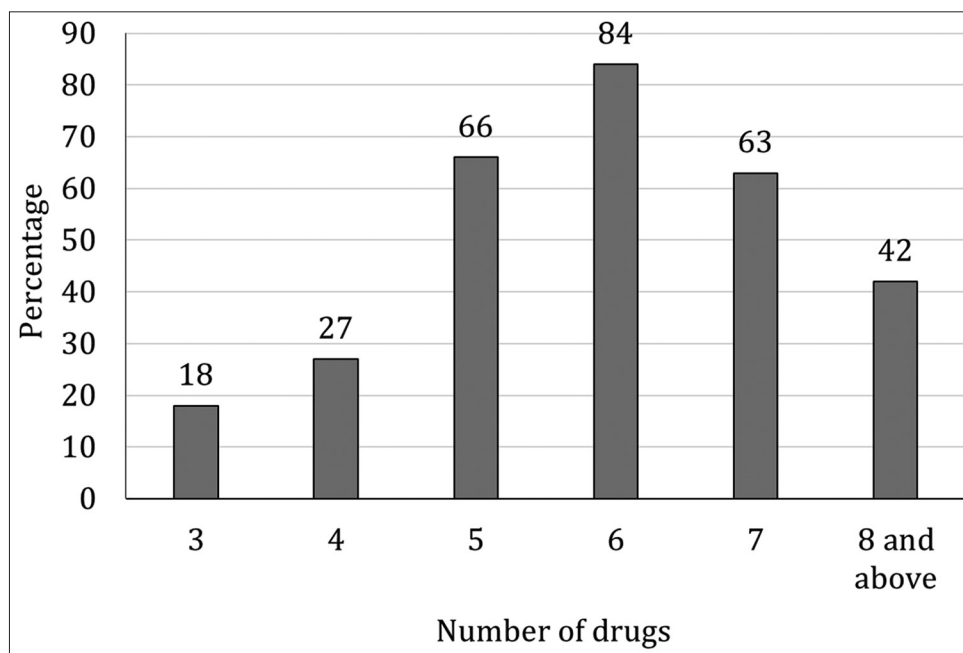


Figure 5: Frequency of the number of drugs prescribed in the study population

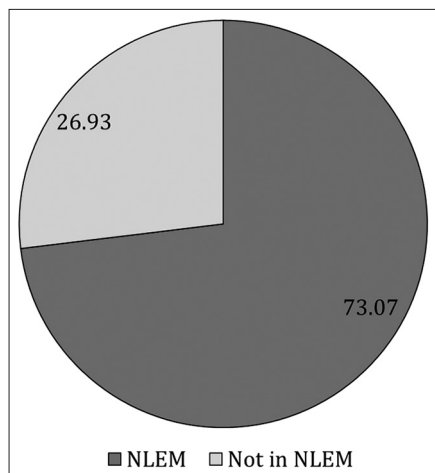


Figure 6: Number of drugs prescribed from national list of essential medicines

of the most commonly prescribed groups of drugs as it can be explained by the increased incidence of hypertension in the elderly.

The study strength is that it was a prospective study and considered geriatric patients according to the definition by Indian standards. It has included the prescribing indicators mentioned by the WHO which is considered the standard for studying the drug utilization pattern. The study is not without limitations. The quality and rationality of prescribing were not looked into in detail. The study was single centered and of short duration.

CONCLUSION

Our study has generated a drug utilization database for geriatric patients. As the aging population is on rise, drug use in older patients is becoming pivotal and so is the need for its study in greater detail. To conclude, the present study has generated data on disease pattern in the elderly, drug use in elderly, and prescription of drugs from EML. The study can provide baseline for comparison with similar studies from other geographic locations regarding the drug use pattern. Studies of this kind can help in improving the quality of health care by identifying the lacunae in prescribing.

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How to cite this article: Jyothsna CS, Nagarajaiah BH, Shiva Kumar KM. Drug utilization pattern in geriatric inpatients of medicine wards at a government tertiary care hospital. Natl J Physiol Pharm Pharmacol 2019;9(4):320-327.

Source of Support: Nil, **Conflict of Interest:** None declared.