

DRUG UTILIZATION PATTERN AMONG GERIATRIC PATIENTS ADMITTED IN MEDICAL INTENSIVE CARE UNIT OF A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Objective: This study aims to evaluate the drug utilization pattern in terms of defined daily dose (DDD) among geriatric patients admitted in medical intensive care unit (MICU) of a tertiary care hospital.

Methods: Retrospective medical record analysis was performed for the geriatric patients (age ≥ 65 years) admitted in MICU from 1st January 2012 to 30th June 2012. The relevant data were collected in a proforma. The drugs were categorized by anatomical therapeutic classification and their DDD was calculated.

Results: Diabetes mellitus was the most common cause for admission. Parenteral preparations (51.12%) constituted the largest share among all the drugs prescribed. Pantoprazole - A02BC02 with DDD 25.3 was the most commonly prescribed parenteral drug (23.5%). Amlodipine - C08CA01 with DDD 29.0 was the most commonly prescribed oral drug (27.6%). Average number of drugs per patient was 9.37 ± 0.27 . Average number of antimicrobials prescribed per patient was 1.26 ± 0.09 . Ceftriaxone was the commonly prescribed antimicrobial drug.

Conclusion: This study shows the most common causes of admission among geriatric patients in MICU setup and the pattern of drugs used. Drug utilization studies of this type may ultimately help in improving the quality of healthcare given to the geriatric patients.

Keywords: Anatomical therapeutic chemical classification, Defined daily dose system, Drug utilization pattern, Geriatric patients.

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, social, and economic consequences" [1]. 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. It also examines the clinical and economic effectiveness of pharmacotherapy. Monitoring medication use and knowledge of prescription habits also help in controlling the medication cost.

In geriatric patients, the pharmacokinetics and pharmacodynamics of a drug are influenced by a range of factors such as comorbid medical conditions, concomitant drugs, age-related changes in organ function and homeostatic control. These factors can have an impact on the effect of drugs used in elderly people. Henceforth it is important to monitor the drug effects, especially adverse drug reactions and drug interactions in geriatric patients [2]. For better understanding of these processes and for a rational and safer drug use, it becomes essential to study the pattern of drug use in geriatric patients.

The assumed average maintenance dose per day for a drug used for its main indication in adults is called defined daily dose (DDD) [3]. It is an internationally accepted tool for comparing drug utilization. The present study was done with the aim of understanding the pattern of drug use and evaluating the drug utilization pattern in terms of DDD in geriatric patients admitted in medical intensive care unit (MICU).

METHODS

This was a retrospective medical record study conducted after prior permission from Institutional Ethics Committee, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka, India.

The medical records of geriatric patients admitted in MICU between 1st January 2012 and 30th June 2012 were analyzed. Data were evaluated for age and gender distribution, common indications for admission and systems involved, duration of hospital stay and total number of drugs prescribed per patient. The proportion of patients receiving particular drugs, its pharmacological groups, anatomical therapeutic classification code, and DDD were calculated. The DDD/100 bed-days was calculated using following equation [3].

$$\text{DDD / 100 bed days} = \frac{\text{Total dose in mg during study period} \times 100}{\text{DDD of drug} \times \text{Study duration (days)} \times \text{Bed strength} \times \text{Average bed occupancy rate}}$$

Other prescribing indicators like total number of antimicrobial drugs per patient, proportion of fixed dose combinations (FDCs), use of drugs by generic and brand names, oral and parenteral formulations, drugs prescribed from National and WHO essential medicine lists were also evaluated [4,5].

Descriptive analysis of the data collected was done by Microsoft Excel software and results were expressed as mean \pm standard deviation and percentage comparison. Mostly descriptive statistics was used.

RESULTS

Totally 38 geriatric patients were admitted in MICU during the study period. Of which 24 (63.2%) were males and 14 (36.8%) were females. Mean age of geriatric patients admitted was 70.38 ± 0.58 years. Average hospital stay per patient was 6.30 ± 0.27 days (males: 6.62 ± 0.38 days, females: 5.81 ± 0.38 days). The total number of drugs prescribed was 354. The most common indication for admission was diabetes mellitus (DM) (Table 1). Cardiovascular system (38.5%) was the most commonly involved followed by respiratory (25.6%), central nervous

system (23.0%), gastrointestinal tract (12.8%), endocrine (7.7%), and renal (5.1%).

About 53.26% drugs were prescribed by generic names and 46.74% drugs by brand names. Total 45.24% and 33.67% drugs were prescribed from National and WHO Essential Drug Lists, respectively. Average number of drugs prescribed per patient was 9.37 ± 0.27 .

At least one antimicrobial drug was prescribed in 29 (76.30%) cases. Average number of antimicrobials prescribed was 1.26 ± 0.09 per patient. Total 13 different types of antimicrobials were used.

DISCUSSION

In our study, mean age of the patients was 70.38 ± 0.58 years. Among the patients admitted there was a preponderance of male cases. The average duration of hospital stay per patient was 6.30 ± 0.27 days, which is comparable to that reported in a similar study conducted by Jhaveri *et al.* where the average duration of stay was 5.07 days [6].

Most common disease condition for which patients were admitted was DM, which is understandable because in India 20% of the elderly population has DM. In addition over 25% of older persons in India have impaired glucose tolerance [7].

Average number of drugs prescribed per patient was 9.37 ± 3.34 . Among the total drugs prescribed only 5.6% were FDC. In FDCs the dose of any component drug cannot be adjusted independently if desired. It also becomes difficult to identify one particular drug, which is causing harmful/beneficial effects hence their benefit/risk ratio should be assessed before they are prescribed [8]. However, considering that the number of FDCs in India, which is around 60% of all available formulations, the use of FDCs in our study was relatively low, reflecting rational use of medicines.

Less than 50% of the total prescribed drugs were from the National and WHO Essential Drug Lists (Tables 2 and 3). Essential Drug List includes the most cost-effective medicines for a particular indication. It is developed in concordance with the standard treatment guidelines

Table 1: Diagnostic indications for admission

Disease condition	Percentage of admissions
DM	25.6
Chronic obstructive pulmonary disease	20.6
Hypertension	15
Cerebrovascular accident	10.3
Acute gastro enteritis	10.3

DM: Diabetes mellitus

Table 2: Commonly prescribed drugs not included in National List of Essential Medicine-2011 of India

Drug name	Percentage
Rabeprazole	13
Sucralfate	6.3
Rosuvastatin	6.2
Piperacillin+Tazobactam	5.5

Table 3: Commonly prescribed drugs not available in WHO essential medicine list

Drug name	Percentage
Pantoprazole	16.8
Clopidogrel	9.1
Atorvastatin	4.8
Enoxaparin	4.2

keeping in mind the healthcare needs of majority of the population. Selection of drugs from of essential list results in a higher quality of care, rational usage of drugs and also cost-effective use of health resources [4].

Parenteral preparations were the most commonly prescribed among all formulations (Table 4). Pantoprazole (A02BC02) with DDD 25.3 was found to be the most frequently prescribed parenteral drug (Table 5). This coincides with the findings of a study conducted in Nepal, which have also shown highest use of Pantoprazole for patients in ICU compared to other drugs. However, one should keep in mind the cost of proton pump inhibitors (PPIs) in comparison with H2-blockers. In general, therapy with PPIs is much costlier than with H2-blockers. Considering the cost-beneficial outcomes, one should be prudent in prescribing PPIs since it may add to the economic burden to the patients [9].

Amlodipine (C08CA01) with DDD 29.0 was found to be the most frequently prescribed oral drug (Table 6). This could possibly be due to the large number of hypertensive cases (15%) admitted in our study.

Table 4: Type of formulations prescribed

Type of preparation	Prescriptions (%) n=354
Parenteral preparations	51.12
Oral preparations	35.02
Other formulations	8.19
FDCs	5.6

FDCs: Fixed dose combinations

Table 5: Commonly prescribed parenteral drugs

Drug name	Percentage	ATC code	Pharmacological group	DDD per 100 bed days
Pantoprazole	23.5	A02BC02	PPI	25.3
Ceftriaxone	20.2	J01DD04	Cephalosporins	11.8
Enoxaparin	15.6	B01AB05	Antithrombotic agents	17776.2
Frusemide	10.4	C03CA01	Loop diuretics	64.7
Ondansetron	7.6	A04AA01	5HT3 antagonist	4.2
Plain insulin	5.2	A10AC01	Insulin and analogues	6.3

ATC: Anatomical therapeutic classification, DDD: Defined daily dose, PPI: Proton pump inhibitor

Table 6: Commonly prescribed oral drugs

Drug name	Percentage	ATC code	Pharmacological group	DDD per 100 bed days
Amlodipine	27.6	C08CA01	Calcium channel blockers	29.0
Enalapril	22.4	C09AA02	ACE inhibitors	97.7
Metoprolol	18.3	C07AB02	β -blockers	4.7
Atorvastatin	8.2	C10AA05	Statins	54.5
Clopidogrel	5.5	B01AC04	Antiplatelet drugs	41.2

ATC: Anatomical therapeutic classification, DDD: Defined daily dose

Table 7: The five most commonly used antimicrobials

Drug name	Percentage
Ceftriaxone	37.5
Piperacillin+Tazobactam	16.7
Azithromycin	10.4
Metronidazole	8.3
Meropenem	8.3

A study conducted by John *et al.* also showed that among the anti-hypertensive drugs prescribed for critically ill patients, amlodipine (C08CA01) was the single most commonly prescribed drug. Critically ill patients are generally more prone to renal failure secondary to sepsis. Henceforth in critically ill patients calcium channel blockers are preferred to ACE inhibitors to avoid hyperkalemia and worsening of renal function [10].

Most commonly prescribed antimicrobial agent was the ceftriaxone (J01DD04) (Table 7) which was in accordance with a study conducted in Puducherry, which also showed ceftriaxone to be the most commonly prescribed antimicrobial agent in MICU [11]. Ceftriaxone has got a longer duration of action ($t_{1/2}$ 8 hrs) and has shown high efficacy in a wide range of serious infections, including bacterial meningitis, multi resistant typhoid fever, complicated urinary tract infections, abdominal sepsis and septicemias, which makes ceftriaxone a commonly prescribed antimicrobial agent in MICU [12]. A study conducted by John *et al.* also mentioned that cephalosporins were the most commonly prescribed antimicrobial agents in MICU setup [13].

CONCLUSION

This study has shown that DM was the most common disease prevalent among geriatric patients admitted in MICU with average of nine drugs prescribed per patient. Parenteral drug formulations were most commonly prescribed. Less than half the total number of drugs prescribed were from National and WHO Model List of Essential Drugs. The results of this study may help in improving the quality of healthcare given to the geriatric patients.

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