



Prescribing Pattern and Medication Inappropriateness in Geriatric Patients in a Tertiary Care Teaching Hospital

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Abstract

Background: Altered hepatic, renal and GIT function along with multiple comorbidities makes use of certain drugs inappropriate in geriatric population. Identification and rectification of mistakes and lacunae in the current prescribing pattern is crucial for ensuring appropriate and rational prescribing. **Purpose:** To study the prescribing pattern and medication inappropriateness in geriatric patients in a tertiary care teaching hospital. **Material and Methods:** Details of the prescribed drugs were obtained from the files of the 60 hospitalised geriatric patients and the prescribing pattern was studied. Medication inappropriateness was assessed and the inappropriate drugs were classified into various categories using Beers criteria given by American Geriatric Society. Number of prescriptions having potential for drug interactions was also calculated. **Results:** Average number of drugs per prescription was 7.7 with antibiotics being the most commonly prescribed drugs. 49.13% were prescribed by brand names. 12.12% drugs were prescribed inappropriately and 20% prescriptions had one or more inappropriate drug. Potential drug-drug interactions that should be avoided in older adults were found in 11.6% prescriptions. **Conclusion:** A considerable fraction of the prescriptions of geriatric patients were inappropriate and incidence of polypharmacy was very high. There is a pressing need to educate the physicians about the mistakes in the prescribing pattern of geriatric patients and the adverse effect it can have on the health of these patients.

Key Words

Beers criteria, Geriatric population, Medication inappropriateness, Prescribing pattern

Introduction

Advancements in science and health care have led to an increase in life expectancy of people, not only in India, but everywhere in the world. This has resulted into a more number of people in the age group >65 years. Hence geriatric health care has become an important part of medical healthcare. Elderly age group differs from younger age group as the people of this age group have decreased renal and hepatic function, slower absorption due to decreased gut motility, decreased plasma protein binding, decreased water content and increased fat content in their bodies. This makes use of certain drugs

in these people inappropriate. Use of such potentially inappropriate drugs can do more harm than good. Another important problem faced by geriatric population is simultaneous presence of many comorbid conditions which results in polypharmacy, which in turn leads to more chances of drug interactions. This again can prove to be detrimental to their health.

Keeping in mind the above said problems, it is needless to say that appropriate and judicious use of drugs in this

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age group is crucial. Appropriateness in healthcare has been defined as “the outcomes of process of decision making that maximizes net health gains within society’s available resources”. Appropriate prescribing is also associated with reduction of over-use, under-use and misuse of treatment (1). Inappropriate drug prescribing can be defined as the use of medications whose risks outweigh their benefits (2). Inappropriate prescribing is a risk factor for adverse drug reactions and hospitalizations in the elderly and places a considerable burden on the healthcare system (3).

The first and foremost step in appropriate and rational prescribing is to identify the mistakes and lacunae in the current prescribing pattern. Awareness of these mistakes would prove to be a base which would help to educate the existing and budding doctors for better prescribing and thus ensure better and safer geriatric healthcare.

Material and Methods

This cross-sectional study was conducted on 60 hospitalised geriatric patients in various departments of BPS GMC for Women, Khanpur Kalan, Sonapat, Haryana. The study was done as an ICMR approved STS project and was also approved by the Institutional Ethics Committee of the college. Patients of either sex, aged >65 years and who were willing to participate in the study and give written informed consent were included in the study. Patients with incomplete medical records were excluded. Details of the prescribed drugs were obtained from the file of the hospitalised geriatric patients.

Patient particulars like name, age, gender, disease diagnosed (reason for hospitalisation), co-morbid condition/s and duration of hospitalization were recorded. For easier interpretation, diagnosed disease of the patients were categorised according to the system involved. Various drugs prescribed to each patient were studied in detail. The prescribed drugs were classified in the following categories - drugs acting on gastrointestinal system, cardiovascular system, central nervous system, respiratory system, hypoglycaemic drugs, anti hypertensive drugs, analgesics and anti inflammatory drugs, antibiotics, minerals, vitamins and others. Total number of drugs prescribed to each patient was also recorded. Average number of drugs prescribed per patient was then calculated. Number and percentage of drugs prescribed by generic names and number and percentage of drugs prescribed by different routes of administration was also calculated.

Medication inappropriateness was assessed using

Beers criteria given by American Geriatric Society (4). Beers criteria is an explicit list of potentially inappropriate medicines which should be best avoided in older adults in general and in those with certain diseases or syndromes, prescribed at reduced dosage or with caution or carefully monitored. By applying these criteria, the prescribed drugs of the patients were classified as appropriate and potentially inappropriate. Number and percentage of potentially inappropriate drugs was calculated. Drugs which were found to be potentially inappropriate for the patients were again subcategorised into three categories. Category A included drugs that generally should be avoided in older adults. Category B included drugs that are to be used with caution in elderly. Category C included drugs to be avoided in combination with specific co-morbidity. The number and percentage of drugs falling into each subcategory was calculated for interpretation. Total number and percentage of prescriptions containing one or more inappropriate drug was also calculated. Number and percentage of prescriptions having potential for drug interactions was also calculated according to Beers criteria.

Results

A total of 462 drugs were prescribed to 60 patients who were enrolled for the study. Out of the total of 60 patients, 34 (56.67%) were males and 26 (43.33%) were females. The maximum age amongst females was 85 years and amongst males was 94 years. Maximum number of patients (35%) belonged to the age group of 70-75 years. The mean age of all the patients was found to be 72.73 years. *Table 1* shows the age wise distribution of the patients enrolled in the study. The number of patients hospitalised for < 5 days, 5-10 days, 10-15 days and > 15 days were 43.33%, 48.33%, 3.33% and 5% respectively. *Table 2* shows the disease categorisation (for which hospitalisation was done) of the patients according to the organ system involved. Respiratory diseases were found to be the most common reason for

Table 1: Age Wise Distribution of the Patients

S. No.	Age Group (in years)	No. of Patients
1	65-70	18
2	70-75	21
3	75-80	10
4	80-85	4
5	85-90	5
6	90-95	2
7	> 95	0

hospitalisation affecting 21 (35%) out of the total 60 patients. Almost half of the patients (46.67%) had associated co-morbidity.

Average number of drugs per prescription was

Table 2: Disease Categorisation According to the Organ System Involved

S. No.	System Involved	No. of Patients	Percentage (%)
1	Musculoskeletal disease	1	1.67
2	Cardiovascular disease	3	5
3	Respiratory disease	21	35
4	Gastrointestinal disease	15	25
5	CNS disease	5	8.33
6	Endocrinal disease	1	1.67
7	Infectious disease	6	10
8	Haematological disease	2	3.33
9	Renal disease	1	1.67
10	Miscellaneous disease	5	8.33

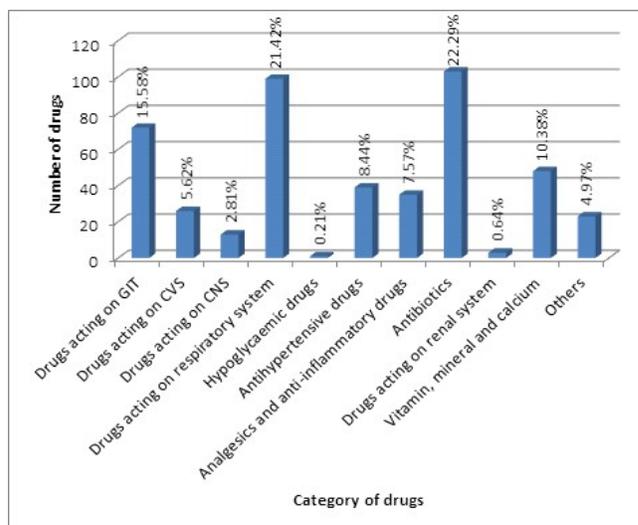


Figure 1: Categorisation of Prescribed Drugs According to the Organ System on Which they are Acting

Table 3: Classification of Inappropriate Drugs into Categories According to Beers Criteria

Category	Name of the drug	No of prescriptions containing inappropriate drugs.
A	Drugs that should be avoided in older adults	
	Benzodiazepines (alprazolam, clonazepam)	3
	TCA (amitriptyline)	1
	NSAIDS (diclofenac, aceclofenac)	24
	Antibiotics (nitrofurantoin)	1
	Total	29
B	Drugs that need to be given with caution in elderly	
	Aspirin (for primary prevention of cardiac events)	10
	Diuretics	16
	Total	26
C	Drugs that are to be avoided with specific co-morbidity	
NSAIDS in heart failure	1	

calculated to be 7.7. Out of the total of 60 prescriptions, 32 (53.33%) prescriptions had 5-8 drugs, 22 (36.67%) of them had more than 8 drugs and only 6 (10%) prescriptions had less than 5 drugs. Although the definition of polypharmacy is not uniform, but the most commonly used definition of polypharmacy is the use of 5 or more drugs per prescription (5). Therefore 54 (90%) out of the total of 60 prescriptions showed polypharmacy. 235 (50.86%) drugs out of a total of 462 drugs were prescribed by generic names. Remaining 227 drugs (49.13%) were prescribed by trade names. Parenteral route of drug administration was the most commonly used route of

administration (48.26%) in our study. Out of 223 parenterally prescribed drugs, the exact route (intravenous, intramuscular, intradermal or subcutaneous) was not specified for 43 drugs although the abbreviation inj. was written before the drugs. Other prescribed routes of administration were oral (39.39%), inhalational (11.69%) and topical (0.65%). Out of the total of 462 prescribed drugs, drug doses were not mentioned for 124 drugs.

Figure 1 shows the categorisation of prescribed drugs according to the organ system on which they are acting. Antibiotics were found to be the most frequently



prescribed drugs. 103 (22.29%) out of the 462 drugs were antibiotics. Hypoglycaemic drugs were found to be the least prescribed drugs (1.51%). After applying the Beers criteria, it was found that out of the total of 462 prescribed drugs, 56 (12.12%) drugs were prescribed inappropriately. 12 (20%) prescriptions, out of total of 60 prescriptions, were found to be prescribed inappropriately as they contained one or more inappropriately prescribed drug. *Table 3* shows the classification of inappropriate drugs into different categories according to Beers criteria. Out of total of 60 prescriptions, potential drug-drug interactions that should be avoided in older adults according to Beers criteria were found in 7 (11.6%) prescriptions. These were the interactions between NSAIDs and corticosteroids.

Discussion

This study describes the current prescribing pattern of geriatric patients. The majority of patients in this study were males. Respiratory diseases including COPD and asthma were found to be the reason for hospitalisation for the majority of patients (35%) followed by diseases of the gastrointestinal system (25%). Veena *et al.* (6) conducted a study among the elderly at Bangalore and reported that respiratory and cardiovascular diseases were the predominant reasons for admission, which was somewhat similar to this study. In a similar kind of study carried out in the medicine ward of Rajah Muthaiya Medical College and Hospital, Annamalai University, cardiovascular diseases followed by the respiratory diseases were found to be the main reason for hospitalisation (7).

A total of 462 drugs were prescribed to 60 geriatric patients and the average number of drugs per prescription was found to be 7.7. A very high prevalence (90%) of polypharmacy has been reported in this study which is higher as compared to that reported in other studies. Polypharmacy is an issue of concern because it increases the chances of drug-drug interactions manifolds. In a study conducted in Saudi Arabia the average number of drugs per prescription was found to be 7.09 (8). In a study carried out by Upadhyay *et al.* (9) in one of the teaching hospitals in Nepal, the incidence of polypharmacy in elderly patients was found to be 73% whereas in a study carried out in Karnataka, the incidence was found to be 83.5% (10).

Out of 462 drugs, 235 (50.86%) drugs were prescribed by generic names in our study. In a study conducted in Nigeria (11), this percentage was found to be 48.9% which

was very close to our value whereas in a study by Supriya Pradhan *et al.* (12) in Odisha the percentage of drugs prescribed by generic names was only 16% which is very low. Prescribing the drugs according to their trade names increases the cost burden on the patients and goes against the current prescribing instructions given by WHO.

Parenteral route was the most commonly prescribed route of drug administration in our study. It is a matter of concern because the parenteral route is costly and invasive and therefore should be prescribed only when necessary. Antibiotics were the most frequently prescribed drugs (22.29%) followed by drugs acting on the respiratory system (21.42%). The drugs acting on the renal system were the least (0.64%) prescribed. Inadvertent use of antibiotics might increase the problem of antibiotic resistance. In a study conducted in Saudi Arabia drugs acting on the gastrointestinal system were found to be the most commonly prescribed drugs followed by the drugs acting on the respiratory system (8). In a study carried out in Bangalore, antimicrobial drugs (16.94%) followed by GI protective agents (13.93%) were the most commonly prescribed drugs (6). Our study also pointed towards certain important omissions. Drug doses were not mentioned in 124 drugs. Also, the exact route of drug administration was not written in 43 injectable drugs, although the abbreviation inj. was written before them.

According to Beers criteria, 56 (12.12%) drugs out of 462 drugs were prescribed inappropriately, which is high percentage as compared to 4.33% in Bangalore and 4.1% in a different study conducted in South India (6,13). Category A included drugs that should be avoided in elderly. The drugs found in category A included Benzodiazepines, amitriptyline, NSAIDs and nitrofurantoin. Benzodiazepines should be avoided in elderly because older patients have increased sensitivity to benzodiazepines and it increases risk of cognitive impairment, delirium, falls and fractures. Amitriptyline should be avoided in elderly because it is highly anticholinergic, sedating and cause orthostatic hypotension. NSAIDs should be avoided in elderly because of increased risk of GI bleeding or peptic ulcer disease and perforation.

Category B i.e. drugs that is to be given with caution in elderly included aspirin for primary prevention of cardiac events and diuretics. Aspirin increases risk of GI bleeding and peptic ulcers. Diuretics may cause syndrome of inappropriate antidiuretic hormone secretion and hyponatremia. Category C i.e. drugs that should be



avoided with specific co-morbidity included NSAIDs in heart failure. NSAIDs have potential to promote fluid retention and exacerbate heart failure (4).

In our study, out of 60 prescriptions, 12 (20%) prescriptions were inappropriate (containing one or more than one inappropriately prescribed drug). In our study, number of inappropriate drugs was higher but the number of inappropriate prescriptions was lower. This is due to the fact that in our study more than one inappropriate drug was prescribed in some of the prescriptions. In a similar study percentage of inappropriate drugs was found to be 8.71% which is somewhat near to our study (10). In Saudi Arabia the percentage was found to be 15.6% and similar results were found in different studies conducted in India and Japan which reported use of at least one inappropriate medicine in 23.58%, 27.25% and 21.1%, prescriptions respectively (6,8,14,15). Lihite *et al.* (17) in their study reported 6.97% inappropriateness which is very less as compared to our study and also the other studies.

The drug-drug interactions that are potentially inappropriate according to Beers criteria were found in 7 prescriptions (11.66%). A single drug-drug interaction i.e. NSAIDs with corticosteroids was found frequently in 7 prescriptions out of the 60. NSAIDs prescribed along with corticosteroids increases the chances of gastrointestinal bleeding (4). Chitra *et al.* (18) carried out a study on drug interactions in elderly and found that 68% of the prescriptions had potential drug interactions which were very high as compared to our study. Thus, there is a pressing need to educate the physicians about the mistakes in the prescribing pattern of geriatric patients and the adverse effect it can have on the health of these patients.

Conclusion

A considerable fraction of the prescriptions of geriatric patients were inappropriate. Incidence of polypharmacy was very high and may be the reason behind the adverse drug-drug interactions. Studying these prescribing patterns is of grave importance because errors in these patterns can have negative influence on the health of geriatric patients. It is the need of the hour that the medical practitioners and pharmacists become more aware regarding the use of potentially inappropriate drugs and apply the available knowledge and tools while prescribing the medicines. This will lead to cost effective treatments and will be beneficial for the healthcare needs of the geriatric population.

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Conflicts of Interest

There are no conflicts of interest.

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