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A Profile of Drug Utilization Among Elderly Inpatients Admitted at a Tertiary Level Hospital in Bangalore: a Prospective Study

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Abstarct

Objectives: In the elderly population the aging process leads to physiological alterations, which makes these individuals more susceptible to chronic diseases and consequently, to increased drug utilization. The objective of the present study was to assess drug utilization profile and drug-drug interaction (DDI) in the elderly patients in a tertiary care hospital.

Methods: A Hospital-based cross-sectional study was performed to examine pattern of drug use in elderly population aged 60 years and above on 250 inpatients from June 2010 till February 2011. The socio-demographic information of elderly inpatients, drug utilization patterns and DDI was studied.

Results: A total of 2049 drugs were prescribed to 250 patients. Most of the geriatric patients were in age group of 60-65 years. Infectious diseases were the most common diagnosis made, followed by respiratory diseases and central nervous system disorders. The average number of drugs consumed by each patient was 8.19. Antibiotic class was the most commonly prescribed drugs followed closely by cardiovascular system drugs and anti-ulcer agents. Prescription with pantoprazole and clopidogrel showed major drug-drug interaction.

Conclusion: An ongoing audit to check the drug utilization pattern, DDI and developing suitable guidelines for the use of drugs in geriatric population are in great need.

Key words

Geriatric patients, Drug utilization, Drug-drug interactions, Antibiotics

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Introduction

Currently the elderly age group demonstrates the fastest growth worldwide. Aging is associated with an increase in chronic illness, anatomical and physiological changes that affect drug distribution, metabolism, and excretion. Elderly people are the major drug users in the community. In the old age, complex medical conditions are relatively frequent, which may indicate multiple drug therapy. Inadequate prescription and improper use of drugs can produce undesirable outcomes, leading to hospitalization and increased health care costs [1].

The field of ageing and health has become a dominant area of concern in the 21st century. This is due to an increase in the absolute and relative numbers of older people in both developed and developing countries [2]. The population of India is expected to increase to 1,367 million by 2020 and 1,613 million by 2050; of which 9.8% (134 million) and 19.6% (315 million), respectively, will be adults over 60 years [3]. In India, where the average life expectancy is 62.5years, the aging population is growing. Thus, as the number of older people increases, it can be expected that polypharmacy in this population will have significant health, social and economic consequences [4].

The higher prevalence of chronic diseases in the elderly population would be expected to lead to an increase in the use of medication. It is important to examine the pattern of drug use in the elderly, since such information would be helpful in determining whether there is over prescription

of drugs [5]. General practitioner's prescribing rates are 1.6 drugs per patient aged between 10-20 years and 2.8 per patient in age 80 years and above; 14% of elderly patients take five or more drugs concurrently. During hospital admission, elderly patients are prescribed a mean of 5 to 6 different drugs. Inadequate prescription and improper use of drugs can produce undesirable outcomes, leading to hospitalization and increased health care costs. Therefore it is necessary and essential to evaluate the role of community pharmacist in the pharmaceutical care of elderly. Thus the objective of the present study was to assess drug utilization profile in the elderly patients in a tertiary care hospital.

Methods

Study Design and Setting

The present study was a prospective, observational study, conducted at inpatient wards of all units of medicine department of Kempegowda Institute of Medical Sciences (KIMS), Bangalore, a tertiary level referral center and University teaching hospital in South India. The complete project was done according to the permission granted by the Human Ethical Committee of Visveswarapura Institute of Pharmaceutical Sciences, Bangalore.

Patient Selection

For the period June 2010 to February 2011, the researcher's visited inpatient wards of all units of medicine department of KIMs hospital daily and analyzed the case records of the elderly patients. Inclusion criteria were patients of either sex, aged between 60 years and older, who had been admitted on that particular day.

Data Collection

Data was collected from the case sheet, medication chart, lab reports and follow up note of the patients from the day of admission until the patient was discharged. Patient demographic details, medical history, medication history, laboratory data and treatment details were documented into a specially-designed proforma. Age, gender, the date of admission and date of discharge were noted. The diagnosis and the drugs prescribed during the patients' hospital stay along with their dose, frequency, duration and route of administration were recorded.

The number of drugs prescribed to a particular patient during the period of hospitalization was noted, When the same medicine was prescribed by different routes, it was considered as a single medicine. The duration of hospital stay was calculated from the date of admission and date of discharge. The percentage of drugs prescribed by generic name was also calculated. Information on the utilization of all drugs in older patients during the study period was collected, but only the details of the commonly used drugs are presented here.

Data analysis

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Statistical software namely SPSS version 15.0 and Graphpad Prism for windows were used for the analysis of the data.

Results

Among the study sample one hundred and twenty seven patients were aged 60-65 years, 51 patients 66-70 years, 34 patients 71-75 years, 23 patients 76-80 years, and the remaining 15 patients were 81 years or above. The male to female ratio was 1.5:1. Two hundred and eighteen patients stayed at the hospital for up to 10 days, 28 patients for 11 to 20 days and 4 patients for more than 20 days. Of the 250 patients in this study, 11 patients left the hospital against medical advice, and the remaining 204 were discharged from the hospital after the treatment.

Table 1: Age distribution of patients studied

Age in years	Male		Female	
	No.	%	No.	%
60-65	69	46.9	58	56.3
66-70	32	21.7	19	18.4
71-75	22	14.9	12	11.6
76-80	13	8.8	10	10.3
81-85	9	6.1	3	2.9
86-90	1	0.6	1	0.9
91-95	1	0.6	0	0.0

The diagnoses made for the study patients were: infectious disease (in 59 patients), respiratory disorder (53), CNS disorders (28), CVS disorders (27), hematological disorders (19), endocrine disorders (18), gastrointestinal disorders (17), malignant disorders (10), renal disorders (9), bone disorders (4), neurological disorders (3), poisoning (2) and ophthalmic disorders (1). By system, the most common diagnoses made were those relating to the respiratory followed by CNS and CVS systems (Figure 1).

A total of 2049 drugs were prescribed for the 250 patients during their hospital stay, giving an average exposure of 8.19 drugs per patient (range 2-19) (SD ± 4.2). There was no sex difference in the average number of drugs prescribed (8.2 for males and 8.18 for females). Of all the 2049 drugs used, 280 (13.66%) were fixed-dose combination products. About 11.6 % of the patients received four or lesser than four, about half (51.6%) of the patients received 5-9, and about 13.6 % received ten or more than ten drugs concurrently.

Antibiotics were given to over 71.2 % of the patients. More than half (61.2 %) of all the antibiotics were given parentally (all intravenously), either for a part of or

throughout the course. Of all the admitted patients 18% received more than one antibiotic concurrently. Ceftriaxone (38.4%) was the most frequently prescribed antibiotic.

Table 2: Duration of hospitalization of patients

Duration of hospitalization No of days	Male		Female	
	No.	%	No.	%
1-10	127	86.4	91	88.3
11-20	16	10.9	12	11.7
21-30	4	2.7	0	0.0

Cardiovascular drugs were given to over 10.8 % of the patients. The most commonly prescribed drugs for the treatment of CVS disorders were diuretics (30.7%) followed by calcium channel blockers (18.4%), statins (16%) and angiotensin-receptor blockers (8.3%). Among these classes of drugs, furosemide (19.6%), amlodipine (17.8%), atorvastatin (11.7%) and ramipril (5.8 %) were prescribed most commonly.

Among anti-ulcer drugs pantoprazole (72.8%) was most commonly prescribed. Anti-asthmatic drugs were given to over 10.3 % of the patients. Budesonide (25.9%) and salbutamol (17.5%) as inhalation therapy were the most commonly anti-asthmatic drugs prescribed. Among antipyretic analgesics, paracetamol (46.9 %) was prescribed mostly followed by aspirin (15.7%). Among anti-emetics, ondansetron (70.1%) was most commonly prescribed followed by domperidone (15.5%) and metoclopromide (13%). In case of the diabetic patients, insulin (47.2 %) was the preferred therapy followed by combination of metformin and glimipiride (10 %) therapy. The most commonly prescribed drugs for the treatment of CNS

We studied drug- drug interactions in 250 of the cases and we found that total of 120 (48%) cases had interactions. Out of which 27 (22.5%) had major interactions, 68 (56.7%) had moderate interactions and 25 (20.8%) had minor interactions respectively. Among 250 cases and 120 prescriptions identified with DDIs; the number of prescriptions with single DDI in patients during hospitalization was found to be 114 (72%), prescription with 2 interactions were 30 (19%) followed by 3 interactions were found in 6 (4%) of the prescriptions and > 3 interactions were seen in 8 (5%) of the prescriptions. The top 4 potential drug-drug interaction are shown in table 3.

Table 3: Top 4 drug-drug interactions

No.	Drug Combination	Number (%)
1	Pantoprazole and clopidogrel	10 (37.03)
2	Ciprofloxacin and insulin	3 (11.1)
3	Ofloxacin and insulin	2 (7.4)
4	Ofloxacin and metformin	2 (7.4)

Table 4: Total number of drugs and distribution of different type of drugs

Type of drug	Number of drugs	Average number of drugs/patient
Antibiotics	359	1.4
CVS Dugs	326	1.3
Antiasthmatic drugs	212	0.8
Antiulcer drugs	298	1.2
Anti-pyretic analgesics	166	0.7
GI Drugs	151	0.6
Vitamins and other supplements	142	0.6
Anti-Diabetics	110	0.4
CNS Drugs	90	0.4
Antiplatelet Agents	53	0.2
Corticosteroids	26	0.1
Hematologicals	22	0.1
Anti-vertigos	19	0.1
Anti-malarials	15	0.1
Anti-histaminics	15	0.1
Anti-coagulants	15	0.1
DMARD	9	0
Anti-viral drugs	6	0
Anti-septics	4	0
Anti-tuberculosis	5	0
Thyroid agents	4	0
Hormonal Therapy	2	0

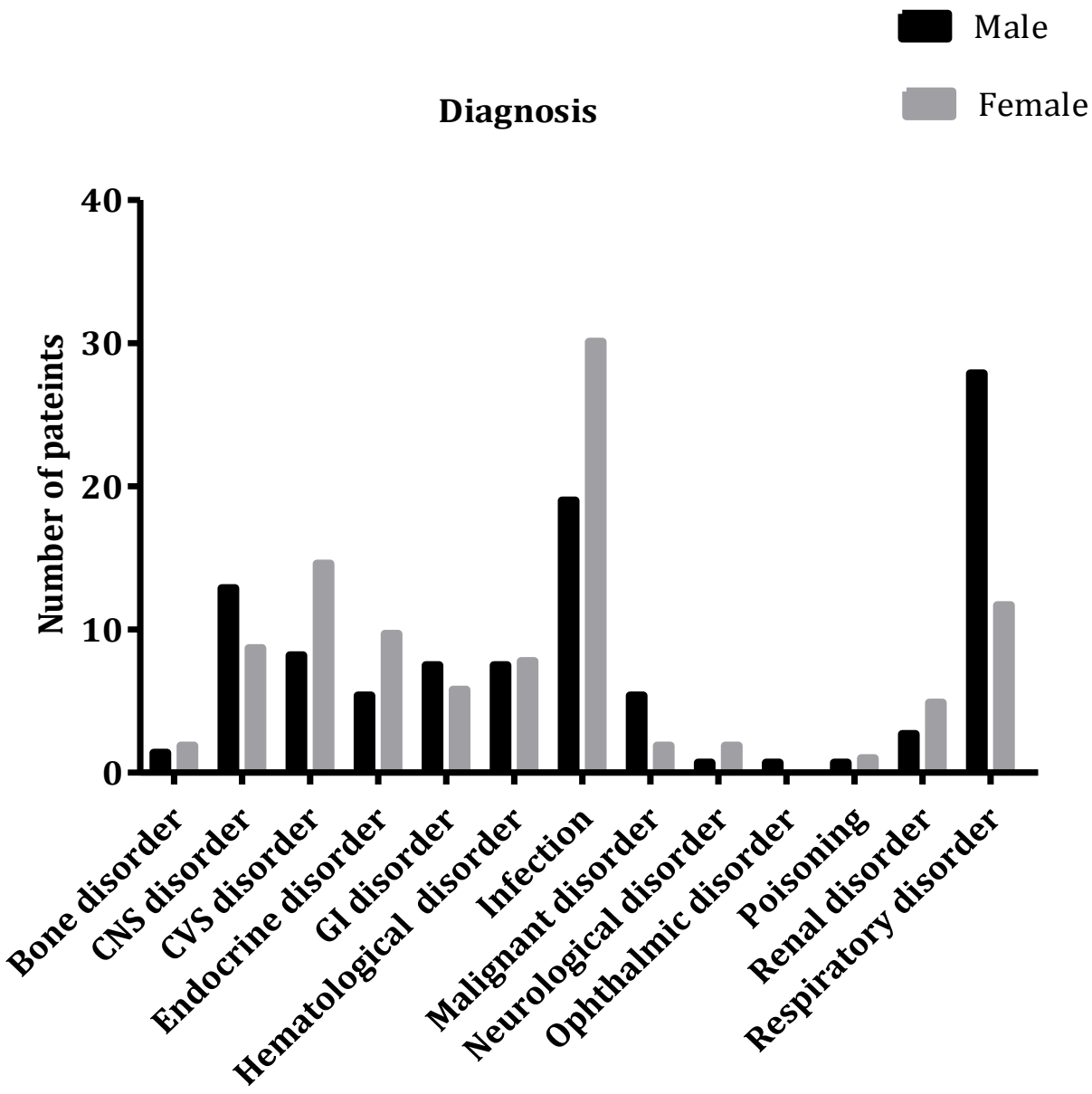

Figure 1: Diagnosis made for the study patients

Discussion

The fact that about half of the patients received 5-9, three-quarters of patients received more than ten and a quarter received four or lesser than four drugs concurrently during hospital stay, it shows that geriatric polypharmacy is prevalent. Polypharmacy has been reported from many developed countries of the world. The higher the number of drugs used concurrently, the increased is the risk of occurrence of adverse effects, drug interactions, and medication errors [6]. With increasing age the vulnerability to develop diseases and the tendency to acquire multiple and chronic disease will increase. Elderly population therefore is prescribed and uses more drugs than younger populations [7]. Outcome of this study identifies higher use of medicines by geriatric group, making them vulnerable to the harmful effects of polypharmacy, such as drug interactions and inadequate use of medicines.

Although the average drug exposure per patient during the hospital stay was found to be 8.2, this figure would go up to 15.66 % if the individual ingredients of the fixed-dose combination products prescribed were taken into account. Findings from our study highlights the fact that use of combination products can lead to a sizeable under estimation of the actual number of drugs prescribed. Although a fixed dose combination product is taken as a

single item, it actually exposes the patient to the actions of all the pharmacologically active ingredients present in it. Unfortunately the real contribution of combination products to therapeutics has been blurred by perception of inherent disadvantages. Considering these criteria is essential to weed out the irrational combination mushrooming in pharmaceutical industry at present.

Of all the drugs, nearly half (50.37 %) was prescribed orally and 45 %, excluding i.v. fluids were prescribed parenterally for a part of or throughout the course. Of the 45 % different drugs that were given parenterally, more than half (22.3 %) were those agents that can be administered by the oral routes also. From our findings, it is suggested to carry out more specific study to see whether and to what extent the drugs used parenterally could be used by the oral route without compromising patient care. This idea behind switch therapy from the parenteral route to another suitable route (usually oral) helps to prevent the extra expense, effort, and hazard involved due to parenteral route of drug administration [8].

It was concern to find that ceftriaxone was the most frequently prescribed antibiotic and was given as an initial antibiotic of choice to more than one-third (138/359) of the patients. Antibiotic was prescribed to treat primary or secondary infection and was also given as prophylaxis to prevent nosocomial infection. Other studies reported that cardiovascular diseases are the leading cause of disease burden and mortality among individuals aged 60 years or more, similar findings were seen in our study as well [9]. The most commonly prescribed drugs for the treatment of CVS disorders were furosemide, amlodipine, atorvastatin and ramipril. The maximum number of moderate interactions involved furosemide and amlodipine interaction (14.7%). Severe postural hypotension has been reported when ACE inhibitors were added to loop diuretic therapy [10, 11].

Antiulcer drugs were given to most of the patients as ulcer and gastrointestinal problems are common among the elders. Among anti-ulcer drugs, pantoprazole was most commonly prescribed. The maximum number of major interactions involved pantoprazole and clopidogrel (37.03 %). It confirms that the use of pantoprazole significantly reduced the antiplatelet activity of clopidogrel. Co-administration with proton pump inhibitors (PPIs) may reduce the cardio protective effects of clopidogrel [12].

High use of analgesics was also found, suggesting that the elderly have a strong urge to relieve or eliminate any acute pain. In case of antipyretic analgesics, paracetamol was prescribed mostly.

Some more drugs that were commonly prescribed in our study were anti-asthmatic or for respiratory disorders drugs and anti-diabetics as respiratory problems and diabetics are common and prevalent disorder among the elderly and the same was seen in our study. Budesonide and salbutamol as inhalation therapy were the most commonly anti-asthmatic drugs prescribed. In case of the diabetic patients, insulin was the preferred therapy followed by combination of metformin and glimipiride therapy. The association between polypharmacy and increased cardiovascular and diabetes drug use among elderly can indicate that exposure to multiple drugs is generally related to long-term treatment of chronic diseases (cardiovascular diseases, hypertension, and diabetes).

Among anti-emetics, ondansetron was most commonly prescribed followed by domperidone and metoclopromide. The most commonly prescribed drugs for the treatment of CNS disorders were alprazolam, amitriptyline, citicholine, phenytoin and gabapentin.

The maximum number of major interactions involved pantoprazole and clopidogrel interaction. It confirms that the use of pantoprazole significantly reduced the antiplatelet activity of clopidogrel. Co-administration with proton pump inhibitors (PPIs) may reduce the cardioprotective effects of clopidogrel. The proposed mechanism is PPI inhibition of the CYP450 2C19-mediated metabolic bioactivation of clopidogrel. The use of PPI should preferably be avoided in patients treated with clopidogrel. PPIs should only be considered in high-risk patients such as those receiving dual antiplatelet therapy, those with a history of gastrointestinal bleeding or ulcers, and those receiving concomitant anticoagulant therapy, and then only after thorough assessment of risks versus benefits. If gastroprotection is necessary, H2-receptor antagonists or antacids should be prescribed whenever possible. Ignoring drug-drug interaction can cause important injuries and clearly affect the process of treatment or even cause serious or fatal problems for the health of patient, thus evidencing the need of constant evaluation of these events in order to prevent them. Further research on the occurrence and consequences of drug interactions in both hospitalized and ambulatory patient shall shed a light on the dangerous implications of drug interactions.

Conclusion

Our study identifies higher use of medicines by the elderly, making them more vulnerable to the harmful effects of polypharmacy. These findings highlight the need for additional studies to further evaluate clinical outcomes associated with polypharmacy and potential drug-drug interactions. The need of the hour is to formulate and implement a set of suitable guidelines for the use of drugs by the elderly people. The number of patients included in the present study is relatively small and it is difficult to directly extrapolate the findings to other hospitals. Further studies aimed at finding out whether similar geriatric prescribing practices exist in other hospitals of Bangalore would therefore be useful.

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Conflict of Interest

All the authors have no conflict of interest

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