Assessment of Medication-Related Problems in Geriatric Patients of a Rural Tertiary Care Hospital

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ABSTRACT

Total world population consists 21% of geriatric population, and the 1991 census report shows that there are 57 millions in India. The high rate chronic problems of elderly patients attributes to various drug-related problems (DRP). It was a prospective observational study where eligible patients were enrolled after obtaining their consent. The patient data were collected in a well-designed data collection form, and the data were data were analyzed statistically. The results showed that among 163 geriatric patients, males were more, i.e. 107 (65.6%), than females 56 (34.4%). A total of 149 (90.2%) patients needed medication counselling (*P = 0.012) and 13 (8%) prescriptions had drug–drug interaction (P = 0.152). Thirty-one (19%) patients were using medication inappropriately (P < 0.001) and 40 (24.5%) patients had risk factors for DRPs (P < 0.001). Laboratory tests were required in 32 (19.6%) patients (P = 0.001) and medical chart errors were reported in 7 (4.3%) patients (P = 0.005). The majority of the patients, 136 (83.4%), had medication-related problems (MRP, P = 0.032). This study concluded that most of the enrolled geriatric patients were using medication inappropriately and most of them had MRP.

Key words: Geriatrics, medication-/drug-related problems (MRP/DRP), noncompliance, polypharmacy

INTRODUCTION

Geriatrics is the branch of subspeciality of internal medicine/general medicine concerned with the clinical, preventive, remedial, and social aspects of illness in the elderly. The term 'elderly' generally refers to patients aged 65 years or over, but the definition is sometimes extended to include people aged 60 years and above. The physiological changes that occur with aging are progressive and gradually occurring over a lifetime rather than abruptly in a given chronological age.[1]

Geriatrics consisting of 21% of the world population and as per the 1991 census reports, in India it was 57 millions. Because of the advances in medical technology and important social, financial, health care planning implication, it has been projected that by the year 2050, the number of elderly people would rise to about 324 million, i.e. 33% of the world population. India has acquired the label of "an aging nation" with the 7.7% of its populations are more than 60 years old in that 75% of elderly persons were living in rural areas.[2-4]

According to the Pharmaceutical Care Network of Europe, medication-related problems (MRP) are defined as an event or circumstance involving drug therapy that actually or potentially interfere with desired health outcomes.[5] MRP/ drug-related problems (DRP) is the third or fourth leading cause of death in the elderly and can also cause disability, depression, gait disturbances, and falls.[6] Some of the factors for increasing the risk of DRP in elderly are suboptimal prescribing (e.g. over use of medications, polypharmacy, inappropriate use, and under use), medication errors (both dispensing and administration problems), patient medication nonadherence (both intentional and unintentional), and multiple medications. These problems are considerably increase the cost of health care system.[7,8]

Polypharmacy is defined as the daily consumption of five or more medications, commonly associated with physician's prescribing tendencies in elderly population.[9,10] Inappropriate medication use in the elderly population leads to decrease health care quality, because of evoking of new symptoms.[11] This can be overcome by rational drug use (RDU). The success of RDU drug therapy in the elderly depends on various factors such as proper diagnosis, treatment plan, patient education, and dose adherence.[12]

Medication noncompliance is defined as the inability of patients to manage their medication (medication adherence).[13] Recent studies report that up to 60% of all medications prescribed are taken incorrectly, or not at all by the elderly leads to 90% of medication error and 35% of potentially serious error (i.e. more vulnerable for noncompliance).[14]

The adverse drug effects in the elderly population can be reduced and perhaps prevented by the physician anticipating the effects of drug toxicity and understanding how the patient's age and health status will likely affect drug dosing. A drug–drug interaction can occur when two or more drugs are used but usually have no demonstrable adverse consequence. However, a notable portion of adverse drug reactions result from drug interactions, in which the effects of one or more drugs become augmented or diminished beyond the limits of the required therapeutic window.[4,10]

The use of safe and effective medicines is the core business of clinical pharmacists. Therefore, the pharmacist can contribute more for resolving these DRP, by ensuring that the medication regimen is appropriate/optimum, effective, available, safe, cost-effective, and correct use.[15]

MATERIALS AND METHODS

This was a prospective, observational study conducted in the Medicine Department of Adichunchanagiri Hospital and Research Centre, B. G. Nagara, for a period of 9 months. Ethical committee clearance was obtained from AHRC prior to the study by a formal procedure.

Study criteria

Inclusion criteria
- Patients of either sex of 60 years and above.
- Patients who are willing to give consent.

Exclusion criteria
- Patients not ready to respond to the query
- Unconscious patients (e.g. continuous coma state).

Sources of data

Inpatients: Patient case records, medication charts and lab reports, and patient/patient care takers interview.

Outpatients: Prescriptions and patient/patient care takers interview.

Materials used: Informed consent form, patient data collection form.

Study procedure

Based on the inclusion and exclusion criteria, the eligible patients were enrolled by taking/obtaining their consent. The well-designed/structured data collection forms were prepared and used. This form mainly contains demographic details, educational qualifications, social habits, current medication, past medical and medication history, laboratory data, and other relevant information. The other relevant data were collected from patient's progress records, treatment chart, laboratory reports, and by a direct patient interview.

The current medication data details include the names of all drugs, their dosage, route of administration with frequency, indication, and the date of drugs started and stopped. The past medication and medical history data consisting of patients previous allergies, co-morbidities, and the drug received previously. The laboratory data includes the various relevant laboratory investigations performed.

The drug therapy of enrolled study participants were routinely monitored and interviewed when necessary and discussed with the physician about identified MRP during ward rounds and at outpatient clinic. While collecting the data of the patients,

patient or their care takers were interviewed with the help of nursing staff to get the complete details. The data collected were subjected/assessed for various DRP (inappropriate use of medication, polypharmacy, noncompliance, ADRs, drug–drug interaction, etc,) by using primary (standard literature), secondary (Micromedex), and tertiary resources (e.g.: BNF, AHFS, and Martindile) which is available in the clinical pharmacy department. Whenever the clinical pharmacist's service was required by the patients/ health care professionals, the service was provided for better therapeutic outcomes (e.g., patient counselling, drug interaction, and drug information). The assessed information was documented and subjected for a suitable statistical method.

Statistical methods

Descriptive statistical analysis has been carried out in this study. A $P < 0.05$ was considered as significant.
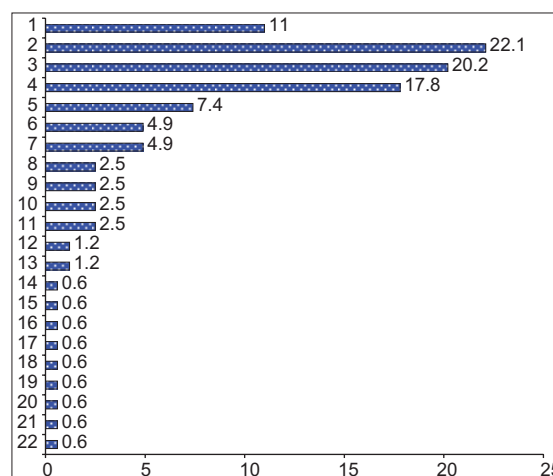
RESULTS

Out of 163 patients, 77.9% were in the age group of 60–70 years and 3.1% were in the age group of 80–90, among 77.9% outpatients were 86.9%, more when compared to inpatients 68.4%. The female patients 34.4% were less when compared to the male patients 65.6%. The illiteracy of geriatric patients was more, i.e. 83.4%. The maximum patients had no occupation in which inpatients and outpatients were 68.4% and 70.2%, respectively [Table 1]. A total of 132 patients had no past medical
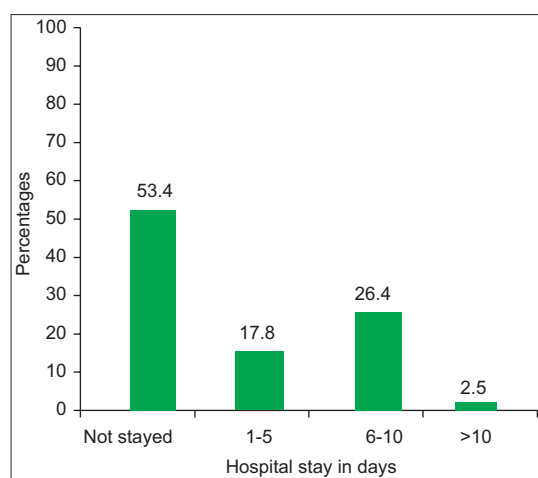
history, but only 31 patients had a medical history, in which Diabetes Mellitus (DM) and hypertension (HTN) was observed in equal number 19 (11.7%) followed by Chronic Obstructive Pulmonary Disease (COPD) 3 (1.8%), asthma, Ischemic Heart Disease (IHD), and the others were 2 (1.2%). The body mass index (kg/ m²) of the patients showed that more elderly were in the normal range 138 (84.7%), underweight were 18 (11.0%), overweight patients were 3 (1.8%), and obese were 4 (2.5%). Social habits of the patients showed that 40.5% had smoking and 20.9% had alcoholic habits [Table 2]. The majority of the elderly patients were diagnosed as DM 36 (22.1%), HTN 33 (20.2%), fever 29 (17.8%), acute GE 18 (11.0%), COPD 12 (7.4%), angina pain 8 (4.9%), and asthma 8 (4.9%). The same number of patients 4 (2.5%) were diagnosed as anemia/CCF/CAD/chest pain, and scabies. Fewer patients were diagnosed as fungal infection, ARF, liver cirrhosis, RTI, UTI, etc., i.e. 1 (0.6%) [Figure 1]. Only 5 (3.1%) patients required dose adjustment for drugs such as phenytoin, digoxin equally in 1 (0.6%) patient and iron supplement in 3 (1.8%) patients. Only 2 (1.2%) patients were not prescribed with any medication and more number of patients 88 (53.9%) were prescribed with 3–5 drugs. Fifty-four (33.1%) patients were prescribed with 6–10 medications and more than 10 drugs were prescribed in 8 (4.9%) patients. Seventy-four (45.4%) patients were had polypharmacy and remaining were not noticed with polypharmacy, i.e. 89 (54.6%). Noncompliance was observed only in 54 (33.1%) patients and interestingly remaining patients had compliance, i.e. 109 (66.9%) patients. The maximum period that the inpatients stayed in the hospital was 6–10 days [Figure 2]. The details of medical-related problems of inpatients and outpatients showed that more than one physician were prescribing medications for a

Table 1: Distribution of basic demographic variables of inpatients and outpatients

Demographic variables	Total		Inpatient (48.5%)		Outpatient (51.5%)	
	N	*%*	*N*	*%*	*N*	*%*
Age in years						
60–70	127	77.9	54	68.4	73	86.9
71–80	31	19.0	21	26.6	10	11.9
81–90	5	3.1	4	5.1	1	1.2
Gender						
Male	107	65.6	58	73.4	49	58.3
Female	56	34.4	21	26.6	35	41.7
Annual income						
<25,000	115	70.6	55	69.6	60	71.4
>25,000	48	29.4	24	30.4	24	28.6
Education						
Illiterate	136	83.4	61	77.2	75	89.3
Primary	25	15.3	17	21.5	8	9.5
High school	2	1.2	1	1.3	1	1.2
Occupation						
None	113	69.3	54	68.4	59	70.2
Farmers	43	26.4	22	27.8	21	25.0
Business	7	4.3	3	3.8	4	4.8
Total	163	100.0	79	100.0	84	100.0

Figure 1: Details on distribution of patients diseases based on their diagnosis

Figure 2: Details on distribution of number of days inpatients stayed in the hospital

Table 2: Details on distribution of patient's smoking and alcoholic habits

Response	Smoking, number of patients (%)	Alcohol, number of patients (%)
No	97 (59.5)	126 (79.1)
Yes	66 (40.5)	34 (20.9)
Every day	55 (33.7)	4 (2.5)
Occasional	11 (6.7)	30 (18.4)

Table 3: Details on distribution of medication-related problems of inpatients and outpatients

Medication-related problems	Total ($N = 163$)	Inpatient ($N = 79$)	Outpatient ($N = 84$)	P value
Does more than one physician prescribe medication?				
No	14 (8.6%)	6 (7.6%)	8 (9.5%)	0.660
Yes	149 (91.4%)	73 (92.4%)	76 (90.5%)	
RX filling at more than one pharmacy				
No	6 (3.7%)	1 (1.3%)	5 (6%)	0.211
Yes	157 (96.3%)	78 (98.7%)	79 (94%)	
Three or more medical problems?				
No	123 (75.5%)	46 (58.2%)	77 (91.7%)	<0.001**
Yes	40 (24.5%)	33 (41.8%)	7 (8.3%)	
Need for counselling				
No	16 (9.8%)	3 (3.8%)	13 (15.5%)	0.012*
Yes	147 (90.2%)	76 (96.2%)	71 (84.5%)	
ADR				
No	163 (100%)	79 (100%)	84 (100%)	NS
Yes	0 (0%)	0 (0%)	0 (0%)	
Drug interaction				
No	150 (92%)	70 (88.6%)	80 (95.2%)	0.152
Yes	13 (8%)	9 (11.4%)	4 (4.8%)	
Inappropriate use of medication				
No	132 (81%)	53 (67.1%)	79 (94%)	<0.001**
Yes	31 (19%)	26 (32.9%)	5 (6%)	
Risk factors for DRPs				
No	123 (75.5%)	43 (54.4%)	60 (71.4%)	<0.001**
Yes	40 (24.5%)	36 (45.6%)	4 (4.8%)	
Need for laboratory tests				
No	131 (80.4%)	55 (69.6%)	76 (90.5%)	0.001**
Yes	32 (19.6%)	24 (30.4%)	8 (9.5%)	
Medical chart error				
No	156 (95.7%)	72 (91.1%)	84 (100%)	0.005**
Yes	7 (4.3%)	7 (8.9%)	0 (0%)	
Medication-related problems				
No	27 (16.6%)	8 (10.1%)	19 (22.6%)	0.032*
Yes	136 (83.4%)	71 (89.9%)	65 (77.4%)	

large number of patients, i.e. in 91.4% and remaining 8.6% were following up regularly with one doctor only. Moreover, 96.3% were get filled their medications from more than one pharmacy, and 24.5% patients had more than three or more problems and the remaining have less problems ($P < 0.001$). The majority of the patients 90.2% were needed counselling about their medication ($P = 0.012$). Interestingly no ADRs were observed during the study. Drug interactions were reported only in 8%. The 19% patients had an inappropriate manner of medication usage, and interestingly the remaining 81% patients had no inappropriate medication usage ($P < 0.001$). The majority of the patients 75.5% had no risk factors for DRPs and 24.5% patients had a drug-related risk factors for DRP ($P < 0.001$). The majority of the patients were not required any laboratory tests, but 19.6% patients needed/required a laboratory ($P = 0.001$) monitoring process. The 4.3% patients had medical chart errors ($P = 0.005$), and maximum elderly patients, i.e. 83.4% showed a MRP ($P = 0.032$) [Table 3].

DISCUSSION

The male outpatients were observed more in the age group of 60–80 years. Some peoples had chronic problems and precipitating factors such as physical activity and hyperactivity. Loneliness/lack of support/care take and stressful situations may be more responsible for DRP. Interestingly illiterate geriatric patients' income was less than Rs. 25000 per year, because this study was conducted in a rural area and the majority of the people have a low socio-economic status in which most of them were farmers.

The past medical history details of 19.1% elderly patients showed that most common diseases were DM, HTN,

COPD, asthma, and IHD, and most of them were unable to remember about their past medical/medication history because of age progress, less awareness about their medical/disease condition, and high dependency on traditional medicines. The majority of the enrolled had normal BMI and very few (18 patients) were under weight

which may be due to not getting sufficient nutrition/ physiological change/economic condition. Only very few were above the normal range. This may because of their hereditary influences. The social habits such as alcohol and smoking are also one of the precipitating factors for DRPs.

The most commonly observed diseases are DM followed by HTN, general's problems such as fever, acute GE, COPD, angina, asthma, anemia, scabies, rheumatoid arthritis, and urinary tract infection. Few patients showed that there is a need of a dose adjustment in drugs such as phenytoin, digoxin, and oral iron supplements. Generally elderly patients who prescribed with oral iron supplements need a little higher dose because of reduced gastric secretions and achlorhydria may lower the capacity for iron absorption. Phenytoin and digoxin need dose adjustment because decreased metabolism in elderly may lead to accumulation; so dose required/ recommendation might be low. The polypharmacy (≥5 drugs) was observed only in 74 patients. This may be because of most of the patients had more than three co-morbidities, symptomatic treatment, or for preventing complication, etc. This might be the reason for prescribing polypharmacy or more drugs. The studies of Hajjar et al., Rahmawati et al., and Cunningham et al. showed the similar results.[16-18] The inpatients stayed in the hospital seemed to be more because these patients must be monitored for comorbid conditions.

This study showed that only 33.1% of the patients were not taking their medications according to the prescription. The low economic status of the patients, complex dosing regimen, confusion, forgetfulness, visual impairment, impaired dexterity, illiteracy, lack of information, etc. might be the reason for noncompliance in these patients. Dependence on more physicians may lead to polypharmacy, inappropriate medication, drug–drug interaction, etc. Among the enrolled patients, the majority were prescribed by more than one physician because most of the outpatients were from the different locality and they might consult other physicians in their locality and another reason is that the geriatric patients might have more than one disease and therefore more than one specialist of each disease may treat the patients. This may be the reason for more than two physicians responsible for drug-related issues.

Interestingly, this study shows that the majority, i.e. 96.3% of the total population, was get filled their medication from more than one pharmacy and only few were collecting the medication from the hospital/the same community

pharmacy. Inpatients during hospital stay will purchase the medicines from the hospital pharmacy and after discharge they will purchase from different pharmacies. This may be one of the factors responsible for medication duplication, omission of drug, etc. and may lead to inappropriate medication and noncompliance.

Due to the physiological and anatomical changes, geriatric patients may have one or more medical problems. This study shows 40 patients had three or more medical problems. The increase in the number of comorbid conditions might lead to polypharmacy and increased the hospital stay. The P value ($P < 0.001$) showed strongly significant for this factor.

Most of the patients were not aware of their present medical conditions and about their medications. Because geriatric patients were not able to remember the information obtained from the physician and other health care professionals. This might be one of the reasons for contributing noncompliance and therapy failure in geriatric patients. This study was conducted in a rural area where the most of the people were illiterate. This factor might be the reason for more patients need counselling. The P value ($P = 0.012$) showed moderately significant for this factor.

The polypharmacy, inappropriate medication use, various pharmacokinetic and pharmacodynamic changes in geriatric patients may lead to drug–drug interaction. Some of the drug interactions noticed were beneficial (synergistic effect) for the patients. Generally, geriatric patients are more prone to adverse drug reactions. Interestingly, our study shows that there were no adverse drug reactions and 19% patients were using the drugs inappropriately. The inpatients were prescribed with more number of medications compared to outpatients and most of the patients were under symptomatic treatment. This might be the reason for more inpatients were using drugs inappropriately. The drugs which were used inappropriately are antibiotics and multivitamins. Wrong dosage forms used in some patients leaded to inappropriate use and noncompliance. The P value for this problem showed ($P < 0.001$) strongly significant.

This study also shows that 24.5% had the risk factors for DRP such as polypharmacy, three or medical problems, noncompliance, etc. This was observed more in inpatients than outpatients. It might be because of inpatients were noticed with more than three medical problems and hence more number of medications, and these patients were not advised for any therapeutic drug level monitoring. The patients who were underweight or obese also had the risk of DRPs. The P value showed ($P < 0.001$) strongly significant.

The 19.6% patients showed that there is a need of a laboratory test based on their diagnosis (culture sensitivity, and antibiotic sensitivity tests) or medication (therapeutic drug monitoring). The P value showed ($P = 0.001$), moderately significant.

This study showed that 4.3% of the medical chart errors were observed only in inpatients. The most errors are omission of some drugs, doses, patient progress report, some lab values, etc. In some inpatients, the duplication of some medication which was not mentioned in medication chart was also observed. This might be the reason for inpatients who were noticed with the medical chart error. The P value ($P = 0.005$) showed strongly significant.

The majority of geriatrics, i.e. 83.4% had MRP because of more medication requirements and long hospital stay. The most commonly observed are need of counselling, need for laboratory tests, drug interaction, medical chart error monitoring, etc. This might be the reason for geriatric inpatients having more MRP than outpatients. The P value ($P = 0.032$) showed moderately significant.

CONCLUSION

This study concluded that geriatric population who have multiple medical problems leads to prescribe more medications, which may be responsible for polypharmacy (45.4%). Current prescribing practices of geriatrics also showed an inappropriate medication, increasing for potential drug interactions, the complicated medication regimens, and an inability to recall the drug regimen, lack of patient education about their medication, poverty, etc. were the risk factors for DRP/noncompliance. This study strongly suggested that there are more existences of DRP (83.4%) in geriatrics. Hence, this study clearly showed that the pharmaceutical care is very much essential/important in geriatric patients of rural population.

ACKNOWLEDGMENTS

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