

# Drug utilization pattern and factors associated with polypharmacy and excessive polypharmacy in geriatric medical out-patients at a rural health training centre in India

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## ABSTRACT

**Context:** Multiple chronic illnesses associated with ageing population demands the role of polypharmacy. Drug utilization study in terms of description of drug use pattern in the geriatric patients aids in monitoring polypharmacy as well as to determine the factors contributing to it. **Objectives:** To analyse the drug utilization pattern in geriatric patients at a rural health training centre. **Subjects and Methods:** A cross-sectional study was conducted in a rural health centre to assess the drug utilization pattern using the WHO core drug prescribing indicators. Polypharmacy was defined as usage of 5-8 drugs and excessive polypharmacy as intake of 10 or more drugs. The drugs were coded using Anatomical Therapeutic Chemical classification. Univariate and bivariate analysis were done using SPSS to present the data. **Results:** Among 207 patients, 29.5% were on polypharmacy and 1.5% patients on excessive polypharmacy. About 75% of patients had one or more comorbid medical condition. A total number of 829 drugs were prescribed and the average number of drugs per prescription was 4.02. **Conclusion:** The drug utilization pattern analysis in the geriatric patients reveals deviation of the average number of drugs per prescription from the WHO standard recommendation. The most common comorbid condition among the geriatric patients was diabetes mellitus. This drug utilization study imparts knowledge about the use of polypharmacy, comorbidities and the pattern of commonly used drugs among the geriatric patients in rural area. Periodic assessment of the pattern of drug utilization in the elderly aids to improve the prescribing pattern and minimize patient harm.

**Keywords:** Drug utilization, geriatrics, polypharmacy

## Introduction

Ageing is at a growing pace globally and is considered to be one of the most significant phenomena of the century. In India by the year 2050 about 12.5% of the population will be 60 years and older as outlined by the United Nations Population Fund (UNFPA) report in 2017. In relation to the health sector, ageing tends to increase the risk of development of concomitant

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chronic diseases significantly.<sup>[1]</sup> This in turn poses a great challenge as the need of quality healthcare rises.

Multiple chronic illnesses in older population demands the role of polypharmacy. According to WHO, the administration of many drugs at the same time or administration of excessive number of drugs is defined as polypharmacy.<sup>[2]</sup> Excessive polypharmacy is defined as concomitant use of ten or more drugs in regular or need basis.<sup>[3]</sup> Use of polypharmacy may increase the risk of adverse drug reactions, drug interactions, patient noncompliance with treatment and medication errors especially in the elderly.<sup>[4]</sup>

Drug utilization study in terms of description of drug use pattern in the geriatric patients aids in monitoring polypharmacy as well as to determine the factors contributing to it. About two thirds of the elderly population in India live in rural areas and studies on drug utilization pattern in the elderly in a rural health setup are limited.<sup>[5]</sup> Such studies aid the primary care physicians at rural health centres to improve towards rational prescribing of drugs to the elderly. Also, periodic assessment of the pattern of drug utilization and optimization is essential for a better healthcare to the geriatric population. Hence the objective of this study is to analyse the drug utilization pattern in geriatric patients at a rural health training centre.

## Subjects and Methods

### Study design and setting

A prospective cross-sectional study was conducted for a period of two months in a Geriatric Health Clinic which is held once a week at a rural health training centre after obtaining prior Institutional Human Ethics Committee clearance and as per GCP guidelines.

### Participants

All the geriatric patients irrespective of gender aged above 60 years attending the Geriatric Health Clinic willing to participate in the study and who gave written informed consent were included in the study. Written informed consent written in *patient's* vernacular language was obtained. Out of 296 elderly patients who attended the clinic at the rural health centre during the period of 8 weeks, 207 patients consented to participate in the study. Confidentiality of the study participants was maintained.

### Data collection

Data collection proforma consisting of details such as patient's age, gender, marital status, occupation, socioeconomic and educational status, details of any comorbid conditions, diagnosis and treatment given was recorded from the prescriptions given by the consulting physician. Information regarding health status, usage of medicines, any alternative system of medicine followed was collected through a self-administered questionnaire. Initially a pre-test to elicit the reliability and any problem in clarity or interpretation of questions was conducted and rectified.

## Drug utilization evaluation

The various tools used to analyse the drug utilization pattern were the WHO core drug prescribing indicators wherein the number of drugs prescribed and the dosage regimen of each of the prescription was assessed.<sup>[6]</sup> The brand name of the drugs recorded by the investigator was subsequently coded using Anatomical Therapeutic Chemical (ATC) classification as defined by World Health Organization.<sup>[7]</sup> Polypharmacy was defined as usage of 5 to 8 drugs whereas excessive polypharmacy was defined as intake of 9 or more drugs.

## Statistical analysis

Data collected was entered into Microsoft excel. Data analysis was performed using SPSS software version 17. Univariate analysis such as frequencies and percentages were used to present the data. Relation between dependent and independent variables will be given by bivariate analysis. The *P* value of <0.005 will be considered statistically significant.

## Results

A total of 296 elderly patients who attended the geriatric clinic at rural health centre were approached who were willing to give written consent to participate in this study and at the end of 2 months, a total of 207 prescriptions from consented patients were analyzed (response rate: 70%).

On analysis about 29.5% (61) were on polypharmacy and only 1.5% (3) patients were on excessive polypharmacy.

### Characteristics of the elderly patients attending the rural health centre

Out of the 207 patients, 51.2% (106) were males and 48.8% (101) were females. Most of the patients, 42% (87) were in the age group of 65-69 years. One or more comorbid conditions were present in all of the patients (100%) on excessive polypharmacy and in about 84.4% of the patients on polypharmacy [Table 1].

In this study about 18.7% of the elderly patients with polypharmacy and excessive polypharmacy reported about irregular intake of medicines. An overall of 44% patients had visited health care facility in the past one month. None of the patients on excessive polypharmacy revealed to be on any complementary system of medicines [Table 2].

Statistically significant differences were not obtained between the three subgroups of patients namely non- polypharmacy, polypharmacy and excessive polypharmacy, based on their sociodemographic and health related characteristics.

### Comorbid medical conditions prevalent in the geriatric patients

The average number of comorbidities was 1.6 with the most common comorbid medical condition being diabetes mellitus in

**Table 1: Sociodemographic characteristics of the geriatric out-patients at a rural health training centre**

Variable	Non-Polypharmacy n=143 (%)	Polypharmacy n=61 (%)	Excessive Polypharmacy n=3 (%)	Total n=207 (%)
Age in years				
60-64	45 (31.5)	15 (24.6)	1 (33.3)	61 (29.5)
65-69	57 (39.9)	29 (47.5)	1 (33.3)	87 (42)
70-74	24 (16.8)	11 (18)	1 (33.3)	36 (17.4)
75-79	10 (7)	5 (8.2)	-	15 (7.2)
>80	7 (4.9)	1 (1.6)	-	8 (3.9)
Gender				
Male	74 (51.7)	29 (47.5)	3 (100)	106 (51.2)
Female	69 (48.3)	32 (52.5)	-	101 (48.8)
Marital status				
Widowed/Married	58 (40.6)	21 (34.4)	2 (66.7)	81 (39.1)
Unmarried	85 (59.4)	40 (65.6)	1 (33.3)	126 (60.9)
	0	0	0	0
Occupation				
Unemployed/Housewife	65 (45.5)	35 (57.4)	3 (100)	101 (48.8)
Employed	78 (54.5)	26 (42.6)	0	106 (51.2)
Socioeconomic Status				
Lower Middle Class	36 (25.2)	19 (31.1)	1 (66.7)	56 (27.1)
Middle Class	100 (69.9)	40 (65.6)	2 (33.3)	142 (68.6)
Upper Middle Class	6 (4.2)	2 (3.3)	0	8 (3.9)
High Class	1 (0.7)	0	0	1 (0.5)
Educational Status				
Illiterate	64 (44.6)	29 (47.5)	3 (100)	95 (45.9)
Primary Education	54 (37.5)	27 (44.3)		82 (39.6)
Higher Education	25 (17.5)	5 (8.2)		30 (14.5)
Comorbid conditions				
Present	101 (70.5)	51 (84.4)	3 (100)	155 (75)
Absent	42 (29.5)	10 (16.6)	0	52 (25)

about 35.6% (55), followed by hypertension and osteoarthritis in 30.4% (47) of patients respectively [Table 3].

### Prescription pattern of the study population

The average number of drugs per encounter was 4 and about 85.5% (709) of drugs were prescribed by the generic name. Percentage of encounters with an antibiotic injection prescribed were 9.2% and 22.7% respectively. A total of 87.6% (726) drugs were prescribed from National List of Essential Medicine [Table 4].

### Drug utilization pattern of the study population

A total number of 829 drugs were prescribed of which most of the drugs 91.6% (759) were prescribed as oral formulations, while 5.7% (47) and 2.7% (22) were prescribed as injectable and topical preparations respectively. Class A drugs acting on the gastrointestinal system 24% (200) were the most frequently prescribed drugs [Figure 1]. Among the active substances prescribed, majority of the patients received Ranitidine (A02BA02) 19% (158). Further, Metformin (A10BA02) 6% (50) and Enalapril (C09AA02) 8% (66) were the most commonly prescribed drugs for the comorbid conditions such as diabetes mellitus and hypertension respectively [Table 5].

## Discussion

On analysis, a total of 829 drugs were prescribed to the study population. The average number of drugs per encounter was

4 which is much lower when compared to a study done in geriatric patients at a secondary care hospital.<sup>[8]</sup> Although the average number of drugs prescribed is twice that of WHO recommendations, only about 29.5% and 1.5% were on polypharmacy and excessive polypharmacy. It is also notable that half 48.8% of the study population, with one or more comorbidities were not on polypharmacy.

Majority of the drugs 85.5% were prescribed by their generic names. By prescribing generic drugs, the risk of medication errors can be reduced by enabling clear and better communication among the health care professionals. The other advantages of generic drug prescribing is that they are cheap and readily available at various health sectors.

In this study, the most commonly prescribed antimicrobial drug was Amoxicillin (0.8%) and the percentage of encounters with an antibiotic prescribed was 9.7%, which is less than the value reported by Jyothsna *et al.*<sup>[9]</sup> This highlights the rational practice of a judicious use of antibiotics in geriatric patients, which was being followed at the rural health centre. Further, appropriate prescribing of antibiotics tends to play a pivotal role in preventing the emergence of antimicrobial resistance.

A total of 87.6% drugs were prescribed from National List of Essential Medicine as against the WHO standard at 100%.<sup>[10]</sup> One of the WHO initiatives for improving rational prescribing

**Table 2: Characteristics of the elderly patients**

Variable	Non-Polypharmacy n=143 (%)	Polypharmacy n=61 (%)	Excessive Polypharmacy n=3 (%)	Total n=207 (%)
<b>Self-Reported Health</b>				
Good	22 (15.4)	5 (8.2)	0	27 (13)
Moderate	106 (74.1)	48 (78.7)	3 (100)	157 (75.8)
Poor	15 (10.5)	8 (13.1)	0	23 (11.1)
<b>Usage of Medicines</b>				
Regular	69 (48.3)	45 (73.8)	2 (66.7)	116 (56)
Irregular	74 (51.7)	16 (26.2)	1 (33.3)	91 (44)
<b>Health Status</b>				
Any longstanding illness or chronic conditions	13 (9.1)	11 (18)	1 (33.3)	25 (12.1)
Handicap	0	0	0	0
Depression in past one year	8 (5.6)	3 (4.9)	0	11 (5.3)
Contact with health services in past one month	58 (40.6)	31 (50.8)	2 (66.7)	91 (44)
Hospitalization in past one year	14 (9.8)	4 (6.6)	0	18 (8.7)
Undergone any surgery in past one year	4 (2.8)	1 (1.6)	0	5 (2.4)
Nil	46 (32.2)	11 (18)	0	57 (27.5)
<b>Alternative system of Medicine Followed</b>				
Ayurvedic	5 (3.5)	6 (9.8)	0	11 (5.3)
Homeopathic	5 (3.5)	1 (1.6)	0	6 (2.9)
Siddha	4 (2.8)	1 (1.6)	0	5 (2.4)
Unani	0	0	0	0
Nil	129 (90.2)	53 (87)	3 (100)	185 (89.4)

**Table 3: Comorbid medical conditions prevalent in the geriatric patients**

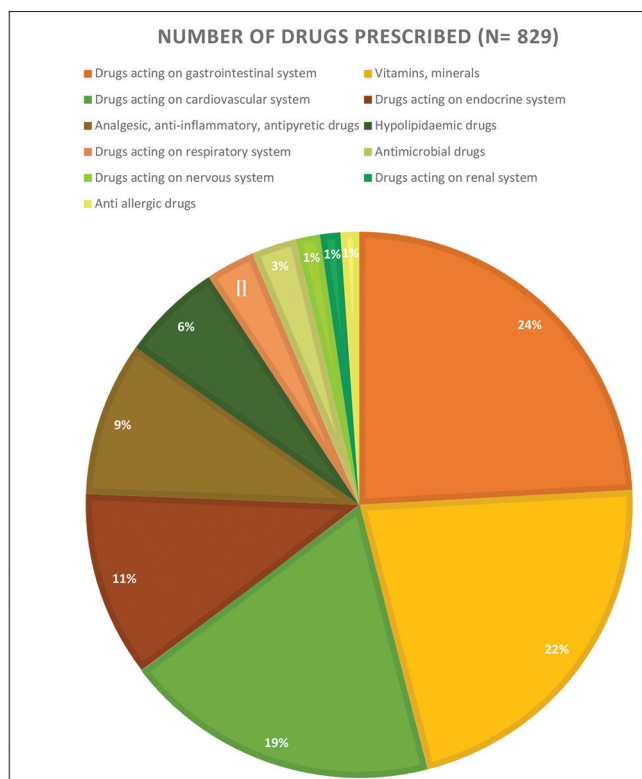
Comorbid medical conditions	Number of patients (percentage of patients who suffered from particular disease)
Diabetes mellitus	55 (35.6)
Hypertension	47 (30.4)
Heart disease	21 (13.5)
Musculoskeletal disorders	42 (27.1)
Osteoarthritis	47 (30.4)
Respiratory diseases	17 (11.1)
CNS disorders	13 (8.5)

**Table 4: Prescription pattern in the study population using World Health Organization core drug prescribing indicators**

Core prescribing indicators	Values
Average number of drugs prescribed per encounter	4
Percentage of drugs prescribed by generic name	709 (85.5)
Percentage of encounters with an injection prescribed	47 (22.7)
Percentage of encounters with an antibiotic prescribed	19 (9.2)
Percentage of drugs prescribed from National list of essential medicine	726 (87.6)
Percentage of drugs prescribed as fixed dose combinations	20 (9.7)

of drugs was the use of drugs from WHO or essential medicines list. By following essential medicines list, the health care professionals tend to prioritize and cater to major medical needs of the population.

One out of three patients in the study population on excessive polypharmacy was on irregular use of medicines and had no contact with the health services in the past one month. Research on the untoward effect such as nonadherence in geriatric patients



**Figure 1: Category-Wise Distribution of the Drugs Prescribed in the Geriatric Population**

on polypharmacy is well established.<sup>[11]</sup> This could be attributed to the cognitive and functional impairment associated with ageing.<sup>[12]</sup>

The most common ATC class of drugs prescribed was class A drugs for alimentary tract and metabolism, majority of which were in relation to gastrointestinal disorders. Further, Ranitidine was the

**Table 5: Drugs utilization pattern according to WHO-ATC classification in the geriatric population**

Category of Drugs	Drug Name	Number of Drugs (%) (n=829)	Dosage Form	ATC Code
Drugs acting on gastrointestinal system	Ranitidine	158 (19)	Oral	A02BA02
	Metoclopramide	15 (1.8)	Oral	A03FA01
	Ondansetron	12 (1.4)	Oral, parenteral	A04AA01
	Loperamide	5 (0.6)	Oral	A07DA03
	Oral rehydration salts	5 (0.6)	Oral	A07CA
Vitamins, minerals	Antacid	5 (0.6)	Oral	A02AD01
	Multivitamins	73 (8.8)	Oral	A11AA03
	Calcium	67 (8.1)	Oral	A02AC01
	Ferrous sulphate	23 (2.8)	Oral	B03AA07
	Vitamin B 12	18 (2.2)	Parenteral	B03BA01
Drugs acting on cardiovascular system	Enalapril	66 (8)	Oral	C09AA02
	Aspirin	29 (3.5)	Oral	B01AC06
	Clopidogrel	26 (3.1)	Oral	B01AC04
	Amlodipine	18 (2.2)	Oral	C08CA01
	Isosorbide dinitrate	10 (1.2)	Oral	C01DA08
	Spiroonolactone	6 (0.7)	Oral	C03DA01
Drugs acting on endocrine system	Metformin	50 (6)	Oral	A10BA02
	Glibenclamide	30 (3.6)	Oral	A10BB01
	Insulin	7 (0.8)	Parenteral	A10AB02
	Betamethasone	4 (0.5)	Topical	D07XC01
Analgesic, anti-inflammatory, antipyretic drugs	Diclofenac	50 (6)	Oral, topical, parenteral	M01AB05
	Paracetamol	16 (1.9)	Oral	N02BE01
	Ibuprofen	10 (1.2)	Oral	M01AE01
Hypolipidaemic drugs	Atorvastatin	49 (5.9)	Oral	C10AA05
Drugs acting on respiratory system	Salbutamol	11 (1.3)	Oral	R03CC02
	Theophylline	3 (0.4)	Oral	R03DA04
	Cough suppressant	10 (1.2)	Oral	R05FB01
Antimicrobial drugs	Amoxycillin	7 (0.8)	Oral	J01CA04
	Metronidazole	5 (0.6)	Oral	A01AB17
	Ciprofloxacin	4 (0.5)	Oral	J01MA02
	Gentamicin	3 (0.4)	Topical	J01GB03
	Norfloxacin	3 (0.4)	Oral	J01MA06
Drugs acting on nervous system	Phenytoin	7 (0.8)	Oral	N03AB02
	Valproate	5 (0.6)	Oral	N03AG01

most commonly prescribed drug. Prevalence of gastrointestinal disorders increase with ageing due to physiological process and also in relation to comorbidities. In this study, Ranitidine was prescribed in most of the encounters as a gastroprotective agent to counteract the epigastric pain associated with the use of non-steroidal anti-inflammatory drugs and Metformin.

This study has provided information about the pattern of drug use among geriatric patients in a rural healthcare center. Its strength is it being a prospective study, using the standard core WHO prescribing indicators and ATC classification of drug codes for analyzing the drug utilization pattern. The limitations of the study were its shorter duration and it being a single centered study.

## Conclusion

The drug utilization pattern analysis in the geriatric patients reveals deviation of the average number of drugs per prescription from the WHO standard recommendation. The most common comorbid condition among the geriatric patients was diabetes mellitus. Among the drugs prescribed, alimentary tract and

metabolism class of drugs were the most frequently prescribed drugs with Ranitidine being the highest prescribed drug among the elderly in the rural health centre. Periodic assessment of the pattern of drug utilization in the geriatric patients aids to improve the prescribing pattern and minimise patient harm.

## Key messages

This study provides an insight about the drug utilization pattern in the geriatric population of rural areas in India.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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