

**Original Article**

**TO ASSESS THE DRUG UTILIZATION PATTERN AND TO ANALYZE PHARMACOECONOMICS FOR GERIATRICS IN-PATIENT IN MEDICINE DEPARTMENT OF TERTIARY CARE TEACHING HOSPITAL**

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**ABSTRACT**

**Objective:** This study was conducted to generate the data on drug utilization pattern among geriatric inpatients in general medicine department.

**Methods:** The patient's prescriptions and medical record files were randomly selected on the basis of inclusion and exclusion criteria at medicine department of Shri Mahant Indires Hospital, Dehradun and the required data for the study were collected in well-designed data collection form and evaluated after the period of 3 mo.

**Results:** Among 175 patients, males were predominant and 31.42% patients were in age group of 71-75 y. Cardiovascular diseases (28%) were most common cause of hospitalization followed by, respiratory disorders (20.57%). Hypertension (25.72%) was most commonly diagnosed disease followed by, diabetes mellitus (22.2%) and chronic obstructive pulmonary disease (14.28%). The most common comorbidity was hypertension and diabetes mellitus. More than 3 co-morbidities were found in 79 patients. Cardiovascular drugs (22.17%) was most frequently prescribed drug followed by, gastrointestinal drugs (15.30%). Among individual drugs pantoprazole (A02BC02) was most commonly prescribed drugs. Total of 1581 drugs was prescribed with an average of 9.03 drugs per prescription. Only 9.63% drugs were prescribed by generic name. Antimicrobials were prescribed in 146 prescriptions, among them ceftriaxone (J01DD04) was frequently prescribed.

**Conclusion:** Most of the drugs were utilized by male patients and the rate of polypharmacy was high.

**Keywords:** Drug Utilization, Geriatrics, Morbidity, Polypharmacy, Pharmacoeconomics

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**INTRODUCTION**

Drug utilization research was defined in 1977 by WHO (world health organization) as "the marketing, distribution, prescription and use of drugs in society; with special emphasis on the resulting medical, social and economic consequences." The evaluation of drug utilization is an important tool for clinical, educational, and pharmacoeconomics purposes [1]. Drug utilization research provides insights into different drug use and prescribing such as pattern of use, quality of use, determinants of use, and outcomes [2]. The aim of drug utilization study is to promote the rational and appropriate use of drugs at the lowest possible dose and cost [3].

In the year 1999, Government of India adopted "National Policy on Older Persons" which define the persons of age 60 y and above as 'senior citizen or 'elderly' [4]. The world is ageing fast and the word geriatric refers to provide medical care to the persons of age 60 y or above. Elderly people with increasing age increase in susceptibility to diseases or disorder and death, reduced reproductive capacity (menopause) and impaired repair and maintenance system [5]. Aging has become major health concern of government all around the world because of their high impact of socioeconomic and increased medical problems. Older people have special problems associated with economics, social support, and health. India is ageing fast and needs special social and medical care [6]. The elderly people of India suffer from both communicable and non-communicable diseases. It is projected that 1 out of 2 (50%) of elderly people in India suffers from at least one chronic disease which requires lifetime medication to treat the particular disease condition [7]. According to Government of India statistics, the prevalence of

comorbidities is also high among the elderly people of India and these include hypertension (14%) followed by diarrhoea (12%), chronic cough (12%), dermatological diseases (12%), illness of heart (9%), diabetes (8.1%), asthma (6%) and urinary problems (5.6%) [8]. About 20% of elderly people use 5 or more drugs and many studies show that the elderly people use prescription as well non-prescription drugs and it is found that 1 out of 25 elderly people is at the risk of major drug interaction [9]. According to the data obtained from NHANES (national health and nutrition examination survey) shows that 74% of peoples of age more than 60 y use prescribed drugs and among them, 37% use 2 or more prescribed drugs, and 5 or more prescribed drugs are utilized by the 12% of elderly people. Elder people of age more than 75 y use at least five drugs and since they are more vulnerable to polypharmacy [10].

**MATERIALS AND METHODS**

The study was conducted among patients of age  $\geq$  60 y admitted in medicine department of Shri Mahant Indires Hospital, Dehradun after getting approval from the institutional ethical committee (No. M. Pharm./IEC/01/2017/3). Total 175 geriatric patients either male or female were randomly included in the study after taking informed consent. The study was prospective cross-sectional. The required data for the study was collected from patient case record file/prescriptions and documented in well-designed data collection form. After the period of 3 mo, all the obtained data were collected together and evaluated to fulfil the objectives of the study. The results were shown using descriptive statistics with the help of MS-EXCEL. The drugs were classified according to WHO-ATC/DDD (anatomical therapeutic code/defined daily dose) classification system.

**Table 1: Inclusion and exclusion criteria of patients**

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>
Patients of age $\geq$ 60 y	Patient below age of 60 y
Either male or female	Patient with severe ailment
Admitted in medicine department	Patients who were shifted to ICU

## RESULTS

In the present study, total 175 prescriptions of a geriatric patient admitted in inpatient medicine department were randomly selected and all the required data for the study was collected and evaluated. The enrolled patients were distributed according to gender and age. Among the study population, a total of 1581 formulations were prescribed with an average of 9.03 drugs per prescription. The following parameters were analyzed and evaluated during the study: socio-epidemiological data; disease or disorder pattern by system involved; disease or disorder diagnosed; co-morbidity pattern; WHO core prescribing indicators; the most commonly prescribed drugs; distribution of drugs according to their therapeutic class; evaluation of polypharmacy; drug cost per patient; classification of prescribed

drugs according to WHO-ATC/DDD (anatomical therapeutic code/defined daily dose) classification system.

### Socio-epidemiological data

Among 175 patients, male (61.28%) predominance was observed in comparison to females (38.28%) as depicted in fig. 1. The majority of patients were in age group of 71-75 y (31.42%) followed by, 61-70 y (21.72%), 81-85 y (21.15%), and only 7.4% of age >85 y (fig. 2). 18.86% patients were illiterate and 32.0% were studied up to 12<sup>th</sup>. It was found that only 17.14% patients were employed and remaining was unemployed. The majority of the patients belong to lower middle class (40.58%) followed by the middle class (36.0%) as depicted in table 2.

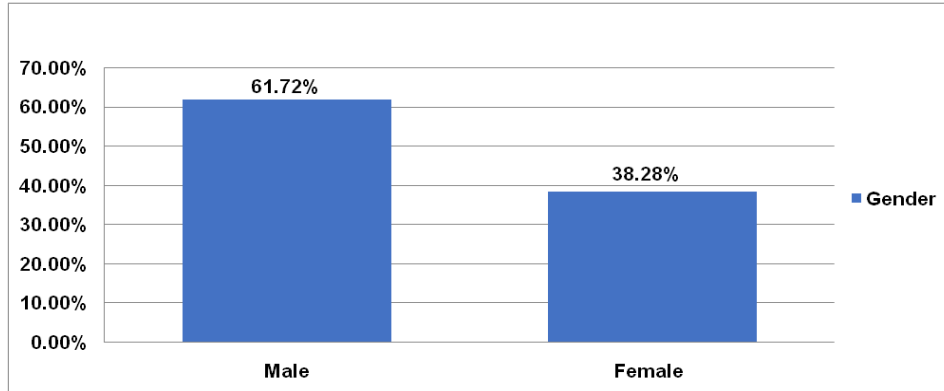


Fig. 1: Gender wise distribution of patients

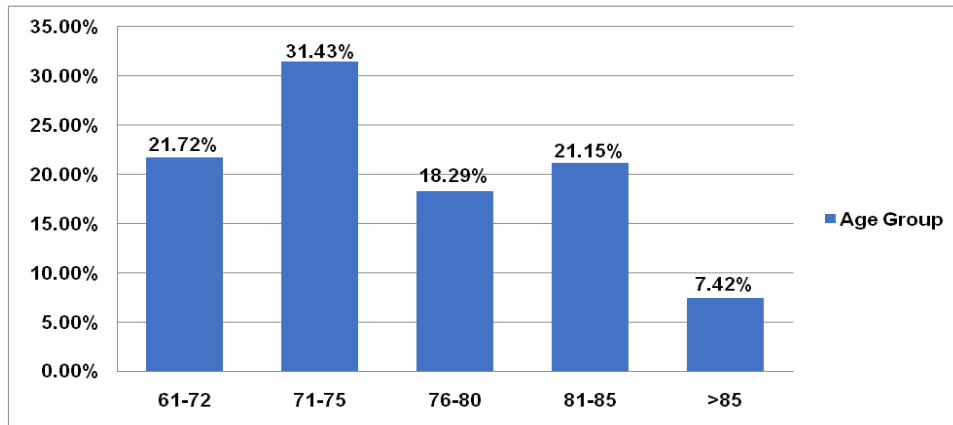


Fig. 2: Age wise distribution of patients

Table 2: Socio-epidemiological data of patients

Parameters	Frequency	Percentage
Literacy		
Illiterate	33	18.86%
Up to 10 <sup>th</sup>	42	24.00%
Up to 12 <sup>th</sup>	56	32.00%
Graduation	41	23.43%
Post-graduation	3	1.71%
Employment		
Working	30	17.17%
Not working	145	82.86%
Living Status		
Living with family	156	89.14%
Living alone	19	10.86%
Economic Status		
Lower middle class	71	40.58%
Middle class	63	36.00%
Upper middle class	41	23.42%

**Disease or disorder pattern by system involved**

Among the study population, the prevalence of cardiovascular disorders (28.00%) was high followed by, respiratory disorders (20.57%), and endocrine disorders (18.29%) as depicted in fig. 3.

**Diseases or disorders diagnosed**

Hypertension (25.72%) was the most commonly diagnosed disease in the study the population followed by, diabetes (22.28%), chronic obstructive pulmonary disorder (14.28%) and cirrhosis (4.57%) was the less commonly diagnosed disease (fig. 4).

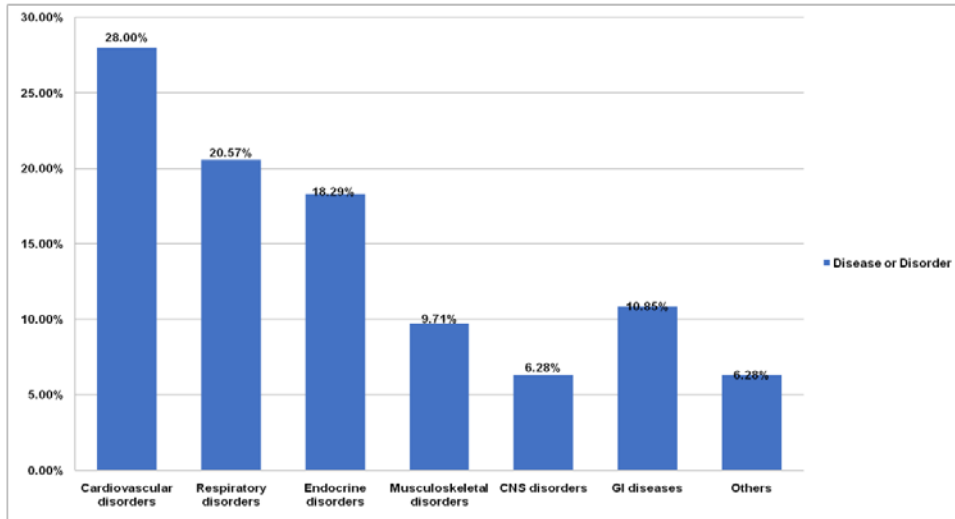


Fig. 3: Disease or disorder pattern with the system involved

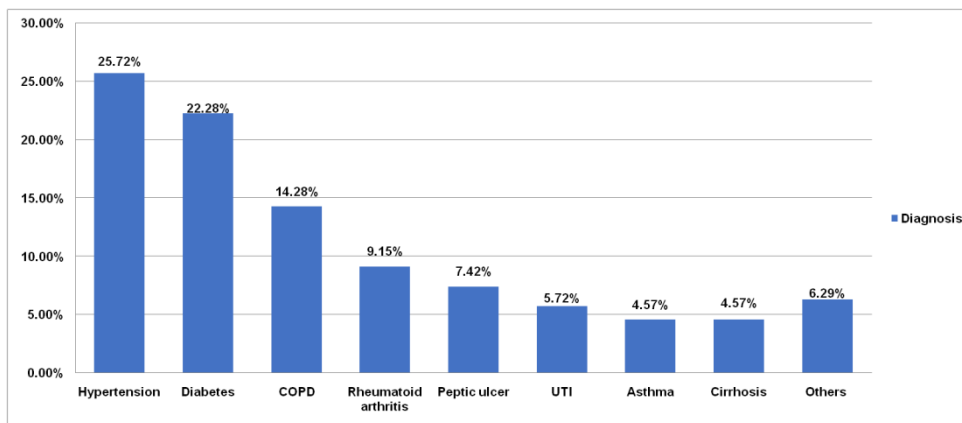


Fig. 4: The most commonly diagnosed diseases

**Co-morbidity pattern**

Majority of patients (38.86%) were found with 3 comorbidities (hypertension, diabetes mellitus, and chronic obstructive pulmonary

disease), 38.28% patients were with 2 comorbidities and only 6.28% patients were with >3 comorbidities.

Only one disease was diagnosed in 16.58% patients (fig. 5).

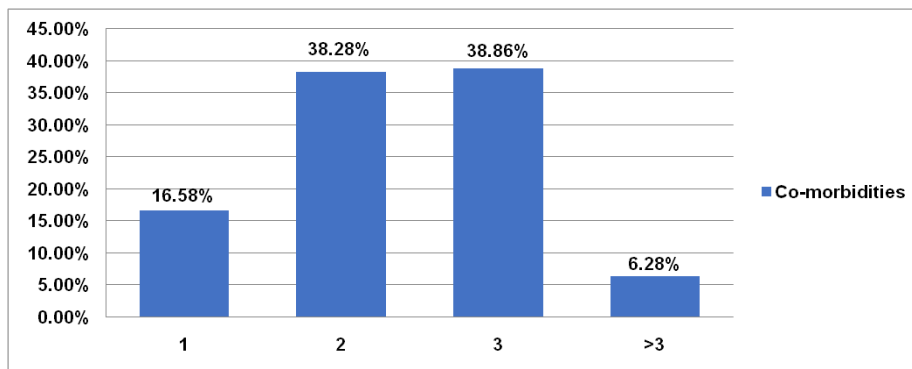


Fig. 5: Co-morbidity pattern in patients

### WHO core prescribing indicators

A total of 1581 drugs were prescribed to the study population with an average of 9.03 drugs per prescription. Only 9.68% drugs were prescribed by their generic name.

The percentage of prescribed drugs from NLEM (national list of essential medicine) and WHO EML (essential medicine list) was found to be 64.01% and 48.38%, respectively. Encounters with antibiotic and parenteral were found to be 83.42% and 92.57%, respectively (table 3).

Table 3: WHO core prescribing indicators

Prescribing indicators	Frequency	Percentage
Percentage of drugs prescribed by generic name	153	9.68%
Percentage of drugs prescribed by brand name	1428	90.32%
Percentage of drugs prescribed from NLEM	1012	64.01%
Percentage of drugs prescribed from WHO EML	765	48.38%
Percentage of antibiotics prescribed	146	83.42%
Percentage of injectable prescribed	162	92.57%

### Most commonly prescribed drugs

Among individual drug pantoprazole (90.86%) was found to most commonly prescribed drugs to the study population followed by B-Complex (83.42%). Among antibiotics, ceftriaxone and amoxicillin were frequently prescribed drugs. Among cardiovascular drugs,

amlodipine was most commonly used drugs. Metformin in combination was most commonly prescribed to diabetic patients.

To treat asthma and chronic obstructive pulmonary disorder, salbutamol and ipratropium bromide in combination were frequently used drugs (fig. 6).

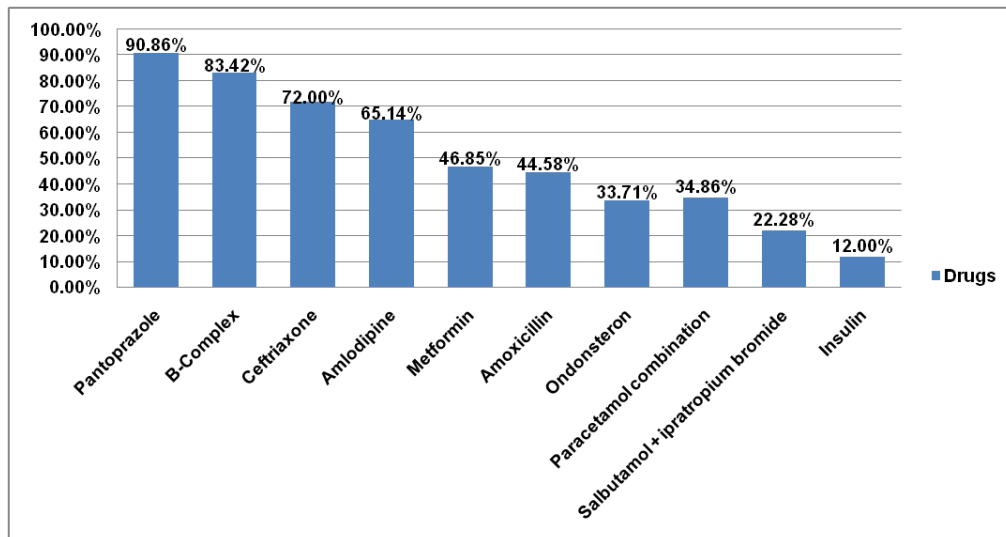


Fig. 6: The commonly prescribed drugs

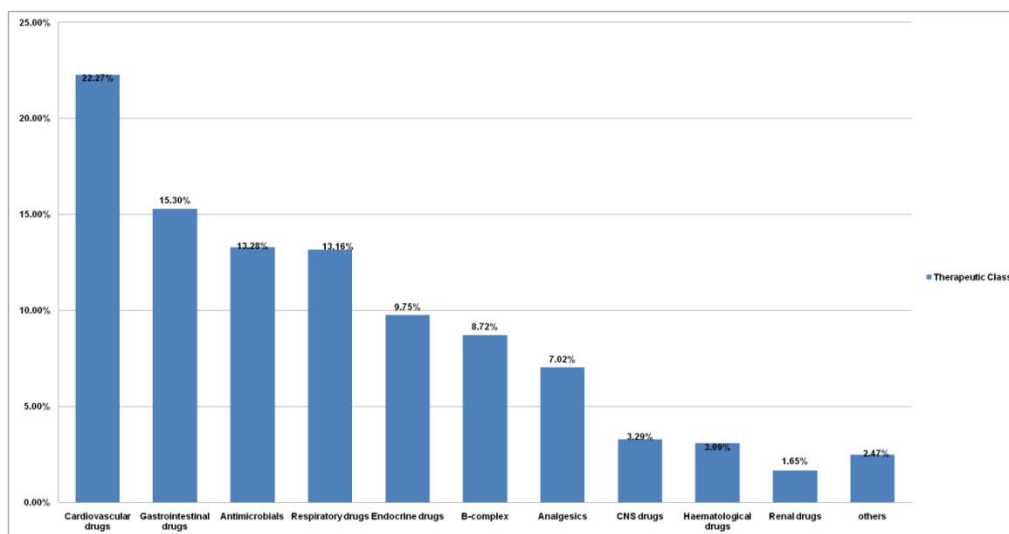


Fig. 7: Therapeutic class of prescribed drugs

### Distribution of drugs according to their therapeutic class

Among 1581 drugs, cardiovascular drugs (22.27%) was most frequently prescribed among the study population followed by, gastrointestinal drugs (15.30%), antibiotics (13.28%) and respiratory drugs (13.16%) as depicted in fig. 7.

### Polypharmacy

A total of 1581 drugs with an average of 9.03 drugs per prescription prescribed to the study population. More than 5 drugs were prescribed to 163 prescriptions (93.14%). 9-12 drugs were prescribed in 48 prescriptions and >12 drugs were prescribed in 9 prescriptions (fig. 8).

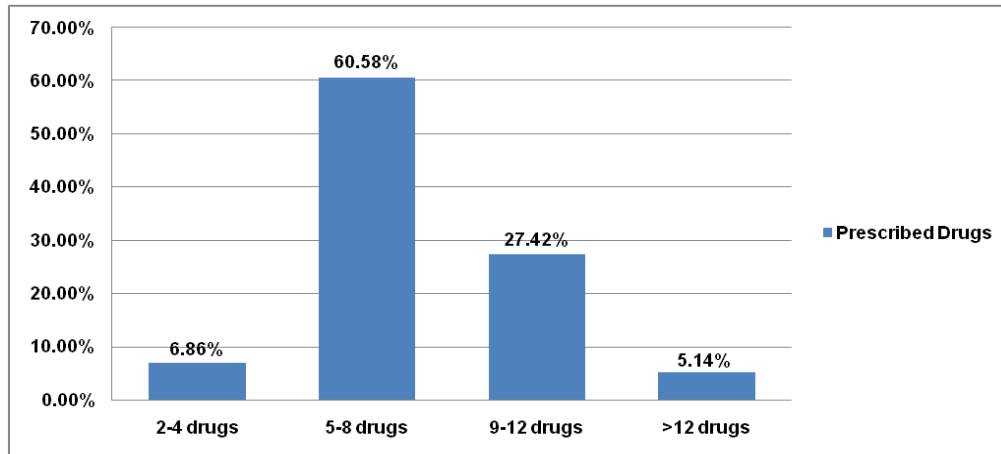


Fig. 8: Drugs per prescription

### Cost per admission

The total expenditure on the drug was found to be INR 108,225 with an average of INR 618 per admission. Antimicrobials were account for more cost burden INR 11825 (10.92%) followed by, respiratory drugs INR 5210 (4.81%), cardiovascular drugs INR 4432 (4.09%) and gastrointestinal drugs INR 4352 (4.02%) as depicted in table 4.

### WHO-ATC/DDD Classification

All the prescribed drugs were classified (Table 5) according to WHO-ATC (anatomical therapeutic code) classification system with DDD (defined daily dose).

### DISCUSSION

Due to ageing elderly people are more vulnerable to various diseases with several comorbidities. To treat the multiple disease multidrug therapy is used. The chances of drug-drug interaction are high due to multiple drug therapy. It is estimated that the incidence of polypharmacy is higher among geriatric people as compared to other age group population. In India people believes that herbal medicines are better than synthetic medicine and thus they use herbal drugs concurrently with other drugs. OTC (over the counter) drugs were also used by the elderly people. In older age, most of the people retired from their work and feel insecure and face financial problems.

Table 4: Cost of various drug classes

Drug class	Total cost (in INR)	Percentage
Cardiovascular drugs	4432	4.09%
Gastrointestinal drugs	4352	4.02%
Antimicrobials	11825	10.92%
Respiratory drugs	5210	4.81%
Endocrine drugs	3915	3.61%
Analgesics and anti-inflammatory drugs	2855	2.63%
B-complex	2740	2.53%
Central nervous system drugs	2067	1.90%
Musculoskeletal	1547	0.14%
Cold and cough	1740	1.60%
Haematological drugs	1095	1.01%
Antituberculars	1512	1.39%

Table 5: Classification of most commonly prescribed drugs according to WHO-ATC/DDD classification system

Drugs	WHO-ATC	DDD	Route
Pantoprazole	A02BC02	40 mg	O, P
Multivitamins and other mineral including combination	A11AA03	--	O
Ceftriaxone	J01DD04	2 g	P
Amlodipine	C08CA01	5 mg	O
Metformin	A10BA02	2 g	O
Amoxicillin	J01CA04	1 g	O, P
Ondonsteron	A04AA01	16 mg	O, P
Paracetamol combination	N02DE51	--	O, P
Salbutamol	R03AC02	0.8 mg, 0.8 mg, 10 mg	Inh. Aero., powd., sol.
Insulin human	A10AE01	40	P

O = Oral; P = Parenteral; T = Topical; U = Unit; TU = Thousand unit; mg = milligram; g = gram

In this study, the numbers of male (61.72%) patients were high as compared to females (38.28%) and are similar to a study conducted by Ramanath et al. 2016 [11], Pradhan et al. 2016 [12]. Maximum patients were in age group of 71-75 y which is different from a study conducted by Swathi et al. 2016, [13] in that study the maximum patients were in age group of 60-70 y. Other study performed by Nayak SR et al. 2015 [14] reported that the percentage of females were more than males and maximum patients were in age group of 60-70 y. These findings suggest that the prevalence of disease among males is higher than females.

18.86% patients were illiterate and 23.43% were the graduate in this study. A study conducted by Nayak SR et al. 2015 [14] reported that, the percentage of illiterate patients were 62% and only 6.7% were the graduate. In this study, the patients who were working was found to be 17.14% and most of the patients were found to be retired and it is similar to other studies conducted by Neha Sharma et al. 2013 [15], Nayak SR et al. 2015 [14].

The prevalence of the cardiovascular disorder was high in this study (28%) followed by, respiratory disorders (20.57%), and diabetes (18.29%). Another study conducted by John et al. 2013 [16] found that prevalence of the cardiovascular disorder was high followed by respiratory disorder and diabetes. Cardiovascular disorders accounted for more hospitalization, among them hypertension was most common and in respiratory disorders the prevalence of the chronic obstructive pulmonary disease was high. The study conducted by Sultan et al. 2015 [17] found that gastrointestinal disorder was the main reason for admission followed by cardiovascular diseases, respiratory diseases, and diabetes mellitus. The presence of co-morbidities in elder people was high in the study, >3 co-morbidities were found in 6.28% followed by, 3 co-morbidities in 38.86%, and 2 co-morbidities in 29 patients. The most common co-morbidities were hypertension and diabetes mellitus followed by respiratory diseases and ischaemic heart disease. The study conducted by Abraham et al. 2015 [18] found that 22.93% patients were with 2 co-morbidities, 14.63% with 3 co-morbidities and more than 3 co-morbidities were in 4.86% patients.

Cardiovascular drugs (22.27%) were most commonly prescribed drugs followed by gastrointestinal agents (15.30%) and antimicrobials (13.28%). A study conducted by Abraham et al. 2015 [18], reported that gastrointestinal drugs (17.28%) were frequently used followed by cardiovascular drugs (17.14%).

Prescription by generic name was very low in this study and only 9.68% drugs were prescribed by generic name. Other studies conducted by Mittal et al. 2014 [19], Geetha S et al. 2014 [20] and Lourdu et al. 2013 [21] has the almost same findings. There is need to encourage the prescribers to prescribe drugs by their generic names. Prescription by generic names also reduces the drug cost. The use of the brand name may also result in the medication errors.

The drugs prescribed from WHO EML (essential medicine list) and NLEM (national list of essential medicine) was found to be 48.38% and 64.01%, respectively. The study conducted by Sapkota et al. 2011 [22] reported that 55% drugs were prescribed from WHO EML and 75% from NLEM.

The antimicrobials were prescribed to 146 (83.42%) patients and it was higher than the study conducted by Veena et al. 2012 [23] only 16.94% antimicrobials were prescribed. The use of this much of antibiotics may result in resistance. The percentage of prescribed parenteral among the study population was found to be 92.57% which was more than other study performed by Abraham et al. 2015 [18].

A total of 1581 drugs were prescribed to the study population with an average of 9.03 drugs per prescription. Prescriptions containing more than 5 drugs fall under the polypharmacy. In this study, 5-8 drugs were prescribed in 106 prescriptions, 9-12 drugs in 48 prescriptions and >12 drugs were prescribed in 9 prescriptions. These findings were similar to studies conducted by Babar et al. 2014 [24], Lourdu et al. 2014 [21] and Abraham et al. 2015 [18]. The prevalence of polypharmacy was higher in all the studies and it is due to the presence of multiple diseases. As per WHO, prescriptions containing more than 5 drugs are fall under the polypharmacy and it

can be eliminated by stopping the use of unnecessary drugs and PIMs (potentially inappropriate drugs).

## CONCLUSION

The maximum drugs were utilized by the male patients and it indicates that the prevalence of diseases is more in elderly males as compared to females. Cardiovascular and respiratory diseases/disorders are the main reason for hospitalization. Majority of the patients were found with multiple co-morbidities and among them, hypertension and diabetes were more prevalent. The rate of polypharmacy is high among the study population. The high prevalence of polypharmacy among geriatrics tends to drug-drug interactions, adverse drug reactions, adverse drug events, patient non-compliance and also increases the treatment cost. The use of antimicrobials was very high and this can lead to antibiotic resistance. The prescription by generic name was very low, and there is a need to encourage to prescribers to prescribe the drugs by generic names. In overall, the pattern of drug use was fair and satisfactory.

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## LIMITATIONS

This research work was undertaken in partial fulfilment of the requirement for the degree of master of pharmacy in clinical pharmacy since the study was of short period and the sample size was small. The data on drug utilization pattern was limited to citizens of Dehradun only.

## CONFLICT OF INTERESTS

Declared none

## REFERENCES

1. World Health Organization WHO Introduction to Drug Utilization Research Geneva: World Health Organization; 2003.
2. Shah BR, Gajjar MB, Desai VS. Drug utilization pattern among geriatric patients assessed with the anatomical therapeutic chemical classification/defined daily dose system in a rural tertiary care teaching hospital. *Int J Nutr Pharmacol Neurol Dis* 2012;2:258-65.
3. Meena VM, Meena A, Agrawal A. Evaluation of drug utilization pattern in indoor patients of the medicine department at tertiary care teaching hospital in southern Rajasthan. *Int J Pharm Sci Res* 2015;2:112-7.
4. Elderly in India-Profile and Programmes. New Delhi: Ministry of Statistics and Programme Implementation. The government of India; 2016.
5. Harrison's Principles of Internal Medicine. 15<sup>th</sup> ed. The Biology of Aging; 2015;57:1-7.
6. Jhaveri BN, Patel TK, Barvaliya MJ, Tripathi CB. Drug utilization pattern and pharmacoconomics analysis in geriatric medical in-patients of a tertiary care hospital of India. *J Pharmacol Pharmacother* 2014;5:15-20.
7. Annual report to the people on Health. Ministry of Health and Family Welfare, Government of India; 2011.
8. Purty AJ, Bazroy J, Kar M, Vasudevan K, Veliath A, Panda P. Morbidity pattern among the elderly population in the rural area of Tamil Nadu, India. *Turk J Med Sci* 2006;36:45-50.
9. Hohl CM, Dankoff J, Colacone A, Afilavo M. Polypharmacy, adverse drug-related events and potential adverse drug interaction in elderly patients presenting to an emergency department. *Ann Emerg Med* 2001;38:666-71.
10. Reamer LB, Emily BM, Temple WS, Jane CA, Kit NS. Polypharmacy: misleading, but manageable. *Clin Interv Aging* 2008;3:383-9.

11. Ramanath KV, Suman C. Study on pharmaceutical care in geriatrics of a rural tertiary care hospital. *Res J Pharm Biol Chem Sci* 2016;7:1568-78.
12. Supriya P, Abinash P, Snigdha RP. Analysis of drug utilization pattern in elderly in an outpatient department using WHO indicators: a cross-sectional study. *Res J Pharm Biol Chem Sci* 2016;7:2628-33.
13. Swathi B, Bhavika. The pattern of medication use among elderly patients attending medicine department in a tertiary care hospital in India. *Asian J Pharm Clin Res* 2016;9:266-9.
14. Swapna RN, Rajeshwari B, Venkatadri TV. Drug utilization pattern in geriatric inpatients of medicine department in a tertiary care teaching Hospital. *Int J Basic Clin Pharmacol* 2015;4:568-73.
15. Sharma N, Uma A, Shobha K, Rahul P, Alka B, Sinha RR. Screening of prescriptions in the geriatric population in a tertiary care teaching hospital in north India. *J Phytopharmacol* 2013;2:38-45.
16. Nimmy, John N, Akshay KN. A study on polypharmacy in senior Indian population. *Int J Pharm Chem Biol Sci* 2013;3:168-71.
17. Sultan HA, Khalid YS, Abdul VM. Prescribing pattern of drugs in the geriatric patients in jazan province, KSA. *Pharm Pharmacol Int J* 2015;2:10-13.
18. Abraham F, Gladis V, Joseph CM, Phebina MJ, Gloria KS. Drug utilization pattern among geriatric patients in a tertiary care teaching hospital. *Asian J Pharm Clin Res* 2015;8:191-4.
19. Mittal N, Mittal R, Singh I, Nusrat S, Malhotra S. Drug utilisation study in a tertiary care center: Recommendations for improving hospital drug dispensing policies. *Indian J Pharm Sci* 2014;76:308-14.
20. Geetha S, Sathisha A, Balaji V, Swetha ES. Analysis of drug utilization pattern among hypertensive patients admitted to medical intensive care unit of a tertiary care hospital. *World J Pharm Res* 2015;4:1320-30.
21. Lourdu JA, Venkata NK, Udhayalakshmi T, Jayapriya B, Maruti. Drug utilization patterns of geriatric patients admitted in the medicine mepartment of a tertiary care hospital. *Int J Pharm Life Sci* 2013;4:3087-92.
22. Sujata S, Nawin P, Singh C, Sagar GC. Drug prescribing pattern and prescription error in elderly: a retrospective study of inpatient record. *Asian J Pharm Clin Res* 2011;4:129-32.
23. Veena DR, Padma L, Sapna P. Drug prescribing pattern in elderly patients in a teaching Hospital. *IOSR J Dental Med Sci* 2012;1:39-42.
24. Babar HS, Hussain S, Maqsood Z, Dad HA, Khan M, Rahman AA, *et al.* Adherence to prescription format and compliance with who core prescribing. *Indicators J Pharm Sci Res* 2014;6:195-9.