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

The world is aging fast and the word Geriatric refers to provide medical care to the persons of age 60 years or above. Drug utilization study on geriatric population is important since this population is neglected in the clinical trials. The aim of this study was to assess the drug utilization pattern among elderly peoples in term of WHO core prescribing indicators and to evaluate the treatment cost. This was the prospective cross-sectional study conducted at medicine department. Total of 175 prescriptions from inpatient medicine department was collected and evaluated. Among 175 patients the percentage of male (61.72%) is more and 31.42% patients was in age group of 71-75 years. Cardiovascular diseases (28%) were most common reason for hospitalization, followed by respiratory disorders (20.57%). Hypertension (25.72%) was most commonly diagnosed disease, followed by diabetes mellitus (22.2%) and COPD (14.28%). The most common co-morbidity was found to be HTN & DM. 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 were prescribed with an average of 9.03 drugs per prescription. Only 9.63% drugs were prescribed by generic name. Antimicrobials were prescribe in 146 prescriptions, among them ceftriaxone (J01DD04) was frequently prescribed. Polypharmacy was high which is generally unavoidable. The prescription by generic name is very low, and
there is a need to encourage to prescribers to prescribe the drugs by generic name and this can eliminate the medication errors.

**KEYWORDS:** Drug Utilization; Geriatrics; Polypharmacy; Co-morbidity; WHO-ATC/DDD.

**INTRODUCTION**

Drug utilization research was defined in 1977 by 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 important tool for clinical, educational, and pharmacoeconomics purposes. Drug utilization research provides insights into different drug use and prescribing such as, pattern of use, quality of use, determinants of use, and outcomes. The aim of drug utilization study is to promote rational and appropriate use of drugs at lowest possible dose and cost.

In the year 1999, Government of India adopted “National Policy on Older Persons” which define the persons of age 60 years and above as ‘senior citizen or ‘elderly’. The world is ageing fast and the word Geriatric refers to provide medical care to the persons of age 60 years or above. Elderly peoples with increasing age increase in susceptibility of diseases or disorder and death, reduced reproductive capacity (menopause) and impaired repair and maintenance system. Gerontology is defined as the study of physical and psychological changes with increases with aging. Gerontology is divided into major classes:

1. Experimental gerontology.
2. Clinical gerontology.

Experimental gerontology is associated with research into biological problems of aging, physiology, psychology, pathology and biochemistry of aging. In other hand, clinical gerontology is associated with researches which differentiate the physiological changes within the human lifespan that affect the risk of age related problems. Ageing has become major health concern of government all around the world because of their high impact of socioeconomic and increased medical problems. Older peoples have special problems associated with economics, social support and health. India is aging fast and needs special social and medical care.

The elderly peoples of India suffer from both communicable and non-communicable diseases. It is projected that 1 out of 2 (50%) of elderly peoples in India suffers from at least
of chronic disease which requires lifetime medication to treat the particular disease condition.\cite{9} According to Government of India statistics the prevalence of comorbidities is also high among the elderly peoples of India and these includes 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%).\cite{10}

About 20% of elderly peoples use 5 or more drugs. Many studies shows that the elderly peoples uses prescription as well non-prescription drugs and it is found that 1 out of 25 elderly peoples are at the risk of major drug interaction.\cite{11} According to the data obtained from NHANES (National Health and Nutrition Examination Survey) shows that, 74% of peoples of age more than 60 years 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 peoples. Elder peoples of age more than 75 years use at least five drugs.\cite{12}

MATERIALS AND METHODS

The study was conducted among patients of age ≥60 years admitted in medicine department of Shri Mahant Hospital, Dehradun after getting approval from Institutional Ethical Committee (No. M.Pharm./IEC/01/2017/3). A total of 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 study was collected from patients case record file and documented in well-designed data collection form. After the period of 3 months 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.

RESULTS AND DISCUSSION

In present study, total 175 prescriptions of geriatrics patients 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:

1. Socio-epidemiological Data
   Gender wise distribution.
   Age wise distribution.
Literacy.
Employment.
Living status.
Economic status.
2. Disease or Disorder Pattern by System Involved.
3. Disease or Disorder Diagnosed.
4. Co-morbidity Pattern.
5. WHO Core Prescribing Indicators.
6. The Most Commonly Prescribed Drugs.
7. Distribution of Drugs According to Their Therapeutic Class.
8. Evaluation of Polypharmacy.
9. Drug Cost Per Patient Per Admission.
10. Classification of Most commonly Prescribed Drugs According to WHO-ATC with their DDD.

Socio-epidemiological Data
Among 175 patients, male (61.28%) predominance was observed in comparison of female (38.28%) as depicted in figure 1. The majority of patients were in age group of 71-75 years (31.42%), followed by 61-70 years (21.72%), 81-85 years (21.15%), and only 7.4% of age >85 years (figure 2). 18.86% patients were illiterate and 32.0% were studied upto 12th. It was found that only 17.14% patients were employed and remaining was unemployed. 89.14% patients were living with their family. The majority of the patients belong to lower middle class (40.58%), followed by middle class (36.0%) as depicted in table 1.

Figure 1: Gender wise distribution of patients
Figure 2: Age wise distribution of patients

Table 1: Socio-epidemiological data of patients

| Parameters          | Frequency | Percentage |
|---------------------|-----------|------------|
| **Literacy**        |           |            |
| Illiterate          | 33        | 18.86%     |
| Upto 10th           | 42        | 24.00%     |
| Upto 12th           | 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 figure 3.
Diseases or disorders diagnosed
Hypertension (25.72%) was the most commonly diagnosed disease in study population, followed by diabetes (22.28%), chronic obstructive pulmonary disorder (14.28%) and cirrhosis (4.57%) was less common diagnosed disease (figure 4).

Co-morbidity pattern
Majority of patients (38.86%) were found with 3 comorbidities (HTN, DM, COPD), 38.28% patients are with 2 comorbidities and only 6.28% patients are with >3 comorbidities. Only one disease is diagnosed in 16.58% patients (figure 5).
Table 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 National List of Essential Medicine and WHO Essential Medicine List was found to be 64.01% and 35.73%, respectively. Encounters with antibiotic and parenteral were found to be 83.42% and 92.57% (table 2).

Table 2: 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

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 was 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 COPD salbutamol and ipratropium bromide in combination was frequently used drugs (figure 6).
Distribution of Drugs According to Their Therapeutic Class

Among 1581 drugs, cardiovascular drugs (22.27%) was most frequently prescribed among study population, followed by, gastrointestinal drugs (15.30%), antibiotics (13.28%) and respiratory drugs (13.16%) as depicted in figure 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 was prescribed to 163 prescription (93.14%). 9-12 drugs were prescribed in 48 prescriptions and >12 drugs was prescribed in 9 prescriptions (figure 8).
Cost per admission

The total expenditure on drug was found to be ₹108,225 with an average of ₹618 per admission. Antimicrobials (C) were accounted for more cost burden ₹11825 (10.92%), followed by Respiratory drugs (D) ₹5210 (4.81%), Cardiovascular drugs (A) ₹4432 (4.09%) and gastrointestinal drugs (B) ₹4352 (4.02%) as depicted in table 3 and figure 9.

Table 3: Cost of various drug classes

| Drug class                              | Total cost | Percentage |
|-----------------------------------------|------------|------------|
| Cardiovascular drugs (A)                | 4432       | 4.09%      |
| Gastrointestinal drugs (B)              | 4352       | 4.02%      |
| Antimicrobials (C)                      | 11825      | 10.92%     |
| Respiratory drugs (D)                   | 5210       | 4.81%      |
| Endocrine drugs (E)                     | 3915       | 3.61%      |
| Analgesics & anti-inflammatory drugs (F)| 2855       | 2.63%      |
| B-complex (G)                           | 2740       | 2.53%      |
| Central nervous system drugs (H)        | 2067       | 1.90%      |
| Musculoskeletal (I)                     | 1547       | 0.14%      |
| Cold & cough (J)                        | 1740       | 1.60%      |
| Haematological drugs (K)                | 1095       | 1.01%      |
| Antituberculars (L)                     | 1512       | 1.39%      |
Table 4: Classification of prescribed drugs according to WHO-ATC Classification System with DDD

| Drugs                                | WHO-ATC  | DDD    | Route |
|--------------------------------------|----------|--------|-------|
| Pantoprazole                         | A02BC02  | 40 mg  | O, P  |
| Multivitamins & other mineral       | A11AA03  | --     | O     |
| including combination                |          |        |       |
| 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  | 0.8mg, 0.8mg, 10mg | Inh. Aero., powd., sol. |
| Insulin human                        | A10AE01  | 40     | P     |

DISCUSSION

Due to ageing elderly peoples are more vulnerable to various diseases with several comorbidities. To treat the multiple diseases multi drug therapy is used and this lead to use multiple drugs. 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 peoples as compared to other age group population. In India people believes that herbal medicine are better than synthetic medicine and thus they use herbal drugs concurrently with other drugs. OTC drugs were also used by the elderly peoples. In older age most of the peoples retired from their work and feel unsecure and face financial problems.

In this study, the numbers of male (61.72%) patients are high as compared to females (38.28%) and is similar to an study conducted by Ramanath et al. 2016,[13] Pradhan et al. 2016[14]. Maximum patients were in age group of 71-75 years which is different from study conducted by Swathi et al. 2016,[15] in that study the maximum patients was in age group of 60-70 years. Other study performed by Nayak SR et al. 2015[16] the percentage of females are more than males and maximum patients are in age group of 60-70 years. These findings suggest that the prevalence of disease among male is higher than females.

18.86% patients were illiterate and 23.43% were graduate in this study. Study conducted by Nayak SR et al. 2015[16] the percentage of illiterate patients was 62% and only 6.7% are graduate. In this study the patients who are working is found to be 17.14% and most of patients are found to be retired and it is similar to other studies conducted by Neha Sharma et al. 2013[17], Nayak SR et al. 2015.[16] Most of the peoples are living with their family.
The prevalence of cardiovascular disorder is high in the study (28%), followed by respiratory disorders (20.57%) and diabetes (18.29%). Other study conducted by John et al. 2013\cite{18} the prevalence of cardiovascular disorder is high followed by, respiratory disorder and diabetes. Cardiovascular disorders are account for more hospitalization, among them HTN is most common and in respiratory disorders the prevalence of COPD is high. The study conducted by Sultan et al. 2015\cite{19} found the gastrointestinal disorder is the main reason for admission followed by cardiovascular diseases, respiratory diseases and diabetes mellitus. The presences of co-morbidities in elder peoples are high in the study, >3 co-morbidities are found in 6.28%, followed by 3 co-morbidities in 38.86% and 2 co-morbidities in 29 patients. The most commonly co-morbidities are hypertension, diabetes mellitus followed by respiratory diseases and ischaemic heart disease. The study conducted by Abraham et al. 2015\cite{20} 22.93% patients are with 2 co-morbidities, 14.63% with 3 co-morbidities and more than 3 co-morbidities was in 4.86% patients.

Cardiovascular drugs (22.27%) were most commonly prescribed drug followed by gastrointestinal agents (15.30%) and antimicrobials (13.28%). Study conducted by Abraham et al. 2015,\cite{20} gastrointestinal drugs (17.28%) was frequently used followed by cardiovascular drugs (17.14%).

Prescription by generic name is very low in the study. Only 9.68% drugs were prescribed by generic name. Other studies conducted by Mittal et al. 2014,\cite{21} Geetha S et al. 2014,\cite{22} Lourdu et al. 2013\cite{23} has the almost same findings. There is need to encourage the prescribers to prescribe drugs by their generic name especially in teaching hospitals because medical and pharmacy students taught only the generic name. Prescription by generic name also reduces the drug cost. The use of brand name also results in the medication errors.

The drugs prescribed from WHO EML and NLEM was found to be 35.73% and 48.38%. The study conducted by Sapkota et al. 2011\cite{24} found that, 55% drugs were prescribed from WHO EML and 75% from NLEM.

The antimicrobials was prescribed to 146 (83.42%) patients was greater than study conducted by Veena et al. 2012\cite{25}, only 16.94% antimicrobials were prescribed. The use of this much of antibiotics is higher than other studies and this may result in resistance. The percentage of parenteral was 92.57% which more than study performed by Abraham et al. 2015.\cite{20}
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 are prescribed in 106 prescriptions, 9-12 drugs in 48 prescriptions and >12 drugs are prescribed in 9 prescriptions. These findings are similar to study conducted by Babar et al. 2014, Lourdu et al. 2014, Abraham et al. 2015. The prevalence of Polypharmacy is much higher in all the studies and it is due to presence of multiple diseases. As per WHO, prescriptions containing more than 5 drugs are fall in the Polypharmacy and it should eliminated by stopping the use of unnecessary drugs and PIMs. The high prevalence of Polypharmacy among geriatrics tends to drug-drug interaction, ADRs, ADEs, patients non-compliance, increase the cost.

CONCLUSION

The maximum drugs were utilized by the male patients and it indicates that, prevalence of diseases is more in elderly male as compared to female and this is due to the life style. Cardiovascular and respiratory diseases/disorders are the main reason for hospitalization. Maximum numbers of patients are with co-morbidities, hypertension and diabetes mellitus are more prevalent. The rate of Polypharmacy is high and many inappropriate drugs were prescribed. The use of antimicrobials is very high and this can lead to antibiotic resistance. The prescription by generic name is very low, and there is a need to encourage to prescribers to prescribe the drugs by generic name and this eliminate the medication errors. In overall, the pattern of drug use is fair.

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