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A STUDY OF PRESCRIPTION PROVIDED TO THE ELDERLY; USING WHO PRESCRIBING INDICATORS AND BEERS CRITERIA

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ABSTRACT

Background: The elderly population is growing rapidly worldwide. Inappropriate prescribing elderly can cause substantial morbidity and result in clinical burden to patient. Gaining insight into physician prescribing pattern to recognize prescribing problem is the fundamental first step in trying to improve the quality of prescribing. **Aims and Objective:** To assess the drug utilization pattern and analyze the prescriptions using who prescribing indicator and beer's criteria 2019 among the elderly patients attending inpatient department of a tertiary care hospital. **Materials and Methods:** A prospective study was conducted at a in-patient department of a tertiary care over a time period of 6 months. All the in-patients aged 65 years and above were included in the study. WHO core prescribing indicators was used to analyze the prescriptions and PIMs were identified using beer's criteria. For the drug utilization aspect of the study the data was collected in structured data collection form which include sex, age, diagnosis, IP number and complete prescription which included the prescribed drugs and dosages. The data obtained were tabulated and analyzed to meet the needs of the objective set forth in the study using Microsoft excel and IBM SPSS statistics version 23 software. **Results:** A Total of 151 patients aged 65years and above were involved in our study. Among 151 patients, 74(49%) were male and 77(51%) were female. The majority of the patients were in the age group 65-69(70.86%) followed by age group of 70-74 years were (11.92%), 75-79 years were (5.96%), 80-84 years were (6.62%) and the lowest number of patients were

in the age group of 85+ years were (4.63%). Total of 1112 drugs were prescribed, giving an average of 7.36 drugs per person (range 1-9). With regard to WHO indicator, a total 569(51.25%) drugs were prescribed by generic name and 767(68.97%) of drugs were prescribed in accordance to WHO Essential Drug List. Out of 151 prescriptions 330 PIMs were identified from Beer's list and majority of drugs were belonging to the class of anti-microbial (13.21%) followed by vitamins and dietary supplements (11.24%), drug acting on GI system (9.5%), Anti-hypertensive (8.27%). **Conclusion:** Study has shown the pattern of drug uses in elderly, PIMs, Polypharmacy were high among the elderly. Prescriber needs to be educated about the beer's criteria and encourage for more rational prescription and to form guidelines for safe and effective uses of medicine in elderly patients.

KEYWORDS: Drug Utilization pattern, Elderly patients, Beer's criteria, PIMs, Polypharmacy.

INTRODUCTION

A variety of pharmacological as well as non-pharmacological factors lead to misuse of medicines resulting in unwanted or harmful situations. Some are even known to cause permanent morbidities and mortality. Some of the well-known factors contributing to irrational use are:

Unregulated promotional activities by manufacturers resulting in over prescribing, under prescribing, prescribing in doses higher than recommended, prescribing medicines when no intervention is required; self-medication and higher drug pricing.

Inadequate background knowledge in pharmacology and therapeutics among the prescribers; Duplication of medicines prescribed as the result of availability of the same medicines in combinatorial forms, multiple brand names, multiple dosage forms.

Inadequacy of information available with prescribers on drug-drug and drug-food interaction leading to altered efficacy, toxicity and margin of safety of medicines.

Socio-economic conditions related to living resulting in unaffordability, underuse, overuse abuse and unauthorized self-medication by patients.

Introduction of new chemical substances as medicines having insufficient scientific evidence on superior efficacy and safety.[1,2,3,4]

Factors other than those related to pharmacology but related to prescribers such as educational background, the circumstances under which the prescribing is done, incentive for prescribing have also contributed to irrational use.

Developments associated with aim of improving use of medicines

Attempts have been made to reduce misuse of medicines by providing internationally accepted definitions of what constitutes misuse, irrational use, medication errors; developing tools aimed at measuring misuse, irrational prescribing; bringing regulations aimed at regulating manufacture, distribution, sale, price of medicines; and guidelines aimed at facilitating equitable and affordable access to medicines. Salient ones have been explained below:

Concept of rational use of medicines: The term irrational was confusing as there was no clarity on what constituted it. What appears irrational to prescribers was sometimes rational from the patient's perspective. A definition was put forward by WHO as to what constitutes *rational use*. It states that "*use of any drug is rational when medicine provided to patients are in line with the one that has been recommended in therapy, in doses that meet their own individual requirements, provided for an adequate period of time and at the lowest cost to them and the community in which they live*". Any deviation from the above criterions is to be considered as irrational.[5]

The concept provided impetus to carry out research on irrational usage covering a wide range of factors leading to irrationality and also their occurrences at different stages associated with medicine use cycle in therapy.

Defining of Medication Errors and Their categorization: United States National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP); provided a broad definition as to what constitutes medication error.[6] Accordingly *"any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer is a medication error. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use."*

A circularly configured index of medication errors categorized into nine types has been provided. Each of the error categories is provided an identity, using a single alphabets ranging from A to I. The categories are also provided with clarifications as to what types of error are covered under it and the anticipated consequence that is cover under them. A further sub categorization of the type of harms that can occur under harmful categories (E through I) is also provide to enabled study of prevalence of different types of harm.

An Algorithm with a "yes or no" question format is also provided to guide health care professionals to determine the category of the error that they are evaluating or reporting.[7] (see appendix……). The index has helped to carry out systematic study of types of medication errors in relation to the end consequence that result from them.

A method of categorizing errors into twelve types covering the stages of prescribing, dispensing, medication administration and patient compliance; has been provided by American Society of Health System Pharmacists (ASHP). The main categories are:

1. *Errors of prescribing*
2. *Errors of Omission*
3. *Wrong time errors*
4. *Unauthorized drug errors*
5. *Improper dose errors (Administration of a dose that is greater or less than the amount prescribed)*
6. *Wrong dosage form errors (Administration of a drug product in a different dosage form from that prescribed)*
7. *Wrong drug preparation errors (Drug product incorrectly formulated or manipulated before administration)*
8. *Wrong administration or technique errors (Inappropriate procedure or improper technique in the administration of the drug)*
9. *Deteriorated drug errors (Administration of a drug that has expired or whose physical or chemical dosage form integrity has been compromised)*
10. *Monitoring errors (Failure to review a prescribed regimen for appropriateness or failure to assess response to prescribed therapy)*
11. *Compliance errors (Failure of the patient to adhere to the prescribed medication regimen)*
12. *Other medication errors (Any error that does not fall into one of the above categories)*

It enabled the overcoming of the problems encountered in study of medication errors in relation to different stages associated with actual medicine use.

Beers criteria: A list of medicines with potential to create harm when used among the elderly; has been put forward by American Geriatrics Society. It was developed making use of a method paper put forward by Dr. Mark Beer and colleagues who listed medicines that could be considered to be inappropriate for long term care facility residents.

List has been revised and updated by the American Geriatrics Society. It is intended for use in clinical practice by clinicians in outpatient as well as inpatient settings (but not hospice or palliative care) to improve the care of patients aged 65 years and older.

Medications listed under Beers criteria have been classified as:

- Those to avoid in most elderly patients (except for those on palliative care or hospice care),
- Those to be used with caution
- Those with high risk.

It also has a list of potentially harmful drug-drug interaction in seniors and a list of medicines that are to be avoided or have their doses reduced, based on renal function.[16] Choice of medications and interactions used for including medication into the list is based on potential harm in relation to benefits in the elderly and the availability of alternatives with better risk/benefit ratio. The list is updated every (…. years)

Avoidance of medicines in the Beers list while prescribing has not convincingly demonstrated a reduction in rate of morbidity, mortality, or cost. However, it is very much in use as quality indicator in the assessment of prescriptions provided to geriatric patients and red flag quality areas that might require intervention or close monitoring.

Medication use decisions must be individualized. If the decision is made to stop a potentially inappropriate medication, tapering may be needed (e.g., benzodiazepines, corticosteroids, acetylcholinesterase inhibitors, PPIs). Drugs categories include in the list are:

1	Analgesics	8	Antiplatelet/Anticoagulants	15	Hormones
2	Antibiotics	9	Antipsychotics	16	Hypnotics
3	Anticonvulsants	10	Anxiolytics	17	Musculoskeletal Agents,
4	Antidepressants	11	Cardiac Drugs	18	NSAIDs

D	Antigout,	12	Central Nervous System Agents (misc.)	19	Respiratory Drugs,
6	Antihistamines,	13	Diabetes Drugs	20	Urinary Drugs
7	Antihypertensives	14	Gastrointestinal Drugs	21	Vasodilators

Key medications seen in the clinical setting that are Beers drugs are:

- *Meperidine:* Risk for delirium and neurotoxicity
- *Tramadol:* Use with caution due to risk for SIADH and resulting hyponatremia
- *Opioids:* Should be avoided in those with fall history (increased risk for falls) or those taking gabapentin or benzodiazepines (increased respiratory depression)
- *SSRIs*: Use with caution due to increased risk for falls and SIADH.
- *Tricyclic antidepressants:* Should be avoided due to anticholinergic effects, sedation, orthostatic hypotension and SIADH.
- *Anticholinergics:* It is recommended to avoid the use of anticholinergics due to risk for increased cognitive impairment, increased confusion and other unpleasant side effects.
- *Anticoagulants:* There are several types of anticoagulants and the main concern with all is bleeding risk, including GI bleeding or bleeding associated with falls.
- *Antipsychotics:* As a general rule these are avoided in the elderly. Of special concern are patients with a history of fall, Parkinson's, dementia, delirium or cognitive impairment.

There are a few exceptions including clozapine and quetiapine.

- *Benzodiazepines***:** Typically these are avoided in the elderly due to increased risk for cognitive impairment and delirium, among other concerns such as falls.
- *Amiodarone:* Avoided as first-line therapy for atrial fibrillation in elderly patients due to higher toxicity than other therapies. Amiodarone also increases the risk of bleeding for patients taking warfarin.
- *Calcium channel blockers:* Typically used to control blood pressure, elderly patients with heart failure should avoid CCBs as they can worsen the condition.
- *Spironolactone:* This potassium-sparing diuretic is advised to be avoided in elderly adults with reduced renal function due to the heightened risk for hyperkalemia.
- *Glyburide:* This sulfonylurea is used to control hyperglycemia in individuals with diabetes. However, its hypoglycemic effects can be profound in the elderly so it is advised that alternates be considered such as glipizide, but used cautiously.
- *Sliding scale insulin:* Something as common as sliding scale, rapid-acting insulin is on the Beers list as a medication that should be avoided. When used as the only medication to

control hyperglycemia (meaning there is no basal insulin or other hypoglycemic agent), rapid-acting insulin has a heightened risk for hypoglycemia in the elderly population.

- *Proton pump inhibitors:* Used to decrease stomach acid, PPIs such as omeprazole should be limited to less than eight weeks duration due to risk for C. difficile infection, bone loss/fractures and pseudomembranous colitis.
- *H2 blockers:* Patients with delirium and renal impairment should avoid H2 blockers (ex: famotidine) due to adverse central nervous system effects that can worsen or cause delirium.
- *Metoclopramide:* This medication is often used for nausea and should be avoided, especially in patients with Parkinson's disease as it can cause tardive dyskinesia and extrapyramidal side effects.
- *Corticosteroids:* Should be avoided in patients with delirium as they can exacerbate the condition. If they must be used, it is recommended to go with the lowest possible therapeutic dose.
- *Aspirin:* Should be avoided, especially in patients with a history of ulcer due to the heightened risk for ulcer development, GI bleeding and even gastric perforation.
- *Estrogens and testosterone:* Hormone replacement therapy is in the "avoid" category due to heightened risk for cancer; testosterone also comes with heightened risk for cardiac events in this patient population.

The list is not exhaustive but provides an idea of some of the common medications that meet Beer's criteria and some in the context around the risks for elderly patients.

Problems associated with prescribing to the elderly

Geriatrics or gerontology is the branch of medicine that deals with the physiological attribute of aging and the diagnosis and treatment of disorder influencing the aged. It has evolved as a medical specialty under General medicine and deals with providing treatment to people who are aged 65 years and above. Chronic and multiple morbidities are more prevalent in them when compared with those of lesser age.

Variation is physiological function, pharmacokinetic and pharmacodynamics does occur as the result of the aging process. Such changes are to be factored while planning to provide support with medication.

Number of drugs taken and the incidence of ADR are high in this age group as treatment with medicines is targeted at multiple chronic morbidities. The situation along with physiological changes that occurs with age, need careful consideration while providing them support with medicines.

Medicines have played a vital role in providing ideal care. Throughout to the last decades of the 21st century, new medicines have decreased mortality, reduced hospitalization duration, and enhance the quality of life for several people. Iatrogenic diseases are also on the rise and are more prominent among the elderly. It is necessary to identify the negative results of drug therapy and arising problem of inappropriate drug use, with issues vary from increased morbidity to enormous medicalization, polypharmacy, adverse drug reactions and higher antimicrobial resistance.

In India clinics specializing in providing geriatric care are in a nascent stage of development and most of it is provided to the elderly through the departments of general medicine. Stressful situations resulting from high patient load often results in prescribes prescribing by habit rather than on the bases of standard treatment guidelines and patient specific needs. Oversight of the problems associated with the special needs of the elderly is common. It is important that attention of prescribers is drawn in this direction by auditing the prescriptions that they provide.

Size of elderly population in India growing rapidly and at the turn of the millennium it stood at 7.4% of the total population. It has been projected that the number of elderly people would rise to about 324 million by the end of the year 2050. A need therefore exists for analyzing drug usage pattern and irrational prescribing with respect to medical problems and special problems that they face with respect to usage of medicines.

Likelihood of taking multiple medications by the elderly is also increasing. According to national health and nutrition examination survey in India, about 74% of the elderly population are on medication and about half of the individuals in the age range of 65 and 74 years are using more than one medicine. Among them 12% are on five or more medications.

Use of medicines with unproven benefit/risk ratio and inappropriate prescribing to the elderly is. is estimated to be the fifth major cause of death among the elderly and is considered as a major public health concern.

Use WHO core prescribing indicators along with Beer's criteria has been considered to a useful tool to access rationality of prescription provided to the elderly.

METHODOLOGY

Study type: A prospective, observational study was conducted at Department of general medicine, Jayanagar General Hospital, Bengaluru for period of six months. The relevant data were collected from case records and evaluated for the World Health Organization (WHO) core prescribing indicators, average number of drugs per prescription, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed, percentage of drugs prescribed from national list of essential medicine (NLEM), and reviewed for potentially inappropriate medication using AGS Beers criteria 2015. The data thus obtained were analyzed using descriptive statistics.

Inclusion criteria: Patients of either gender who are aged 65 years and above seeking medical intervention from the hospital and provided their consent to participate in the study.

Exclusion criteria: Patients who are unwilling to participate in the study, seriously ill requiring intensive care unit admissions or on ventilators and those who were unable to communicate were excluded.

Statistical analysis: Descriptive Statistic was used to analyze data using Microsoft Excel and SPSS software.

RESULTS

Demographic profile of subjects who were provided a prescription

Prescriptions provided to 151 subjects who participated in the study were categorized on the basis of patient's age into age groups. Each group covered an age interval of five years. Short interval was considered so as to accommodate rapid physiological and psychological changes associated with aging among elderly. Results obtained has been presented in tabular form as (Table No. I)

Table No. 1: Age and Gender based Profile of elderly patients provided with prescription.

Age Group	Group Total	Group total expressed as % ratio of total subjects in study(n=151)	Gender	No. of Subjects	Gender based % ratio within the group
65-69	107	70.86%	Male	55	51.40%
			Female	52	48.60%
70-74	19	12,58%	Male	8	42.11%
			Female	11	57.89%
75-79	8	5.30%	Male	03	37.5%
			Female	05	62.5%
80-84	10	6.62%	Male	6	60%
			Female	4	40%
≥ 85	07	4.64%	Male	2	28.57%
			Female	5	71.43%
Grand Total	151	----------	Male	74	49.00%
			Female	77	51.00%

Among the 151 prescriptions provided, 74 (49%) were for male subject and 77 (51%) were for females.

Highest number of subjects encountered (107) was in the age range of 65-69, followed by (19) in the age group 70-74. Together they constitute 83.44% of patients who were provided a prescription.

Lowest number of subjects encountered (7) was in the age range of ≥ 8.

The ratio of male to female in the age group of 65-69; indicated that number of males almost equals the number of females; males (51.4%) and females were 52 (48.6%).

In the case of the age group 70 -74 there was a decrease in the ratio of males by 9% (42.11%) and increase in ratio of females by 9% (57.89).

A further decrease in the ratio was observed in the case of the age group 75-79 wherein the ratio of males to females was 37.5%**:** 62.5%.

The decreasing trend in the ratio of males to females was also observed in the age group of ≥ 8; 28.57%: 71.43%.

Analysis of Prescription Provided to Elderly using WHO core Prescribing Indicators

For the purpose of the study, the number of drugs prescribed in each prescription was considered as the number of incidence of drugs used in it.

Total incidences of drug prescribed were obtained by summing up the incidences obtained in each prescription. The same principle was applied while obtaining the total incidences of drugs prescribed by generic name; those prescribed from WHO Essential Drug List; incidences of antibiotics prescribed and incidences of injections prescribed.

The extent of polypharmacy occurring at the prescribing stage was obtained by dividing the total incidences recorded by the total number of prescriptions provided.

The results obtained were compared with ideal values set by WHO to measure the standard of prescribing. The results obtained are expressed in a tabular form as shown in Table No. 2.

Table No. 2: Values obtained for prescribing indicators compared with WHO standards.

Prescribing indicators assessed	Values Obtained	WHO standard
Total number of prescriptions analyzed	151	----------
Total incidences of drugs prescribed	1112	
Average number of drugs per encounter	7.36	< 2
Percentage of drugs prescribed by generic name	570 incidences 51.25%	100 %
Percentage of drugs prescribed from essential drug list	767 drug NEDL 68.97%	100 %
Percentage of encounters in which antibiotic prescribed	76 prescriptions 50.33%	<30 %
Percentage of encounters in which injection prescribed (149)	108 prescriptions 71.52%	<20 %

There were 1112 incidences of drug use covering 151 prescriptions that was studied.

The number of drugs prescribed ranged between1-9 and the average number of drugs per prescription was 7.36.

Among the total of 1112 drugs prescribed 570 were prescribed using their generic names. Percentage of encounters where generic drugs are used was 51.25%.

Among 151 prescriptions studied; 70 prescriptions were found to have a prescription for antibiotics. Percentage of encounters with antibiotics was at 50.33%

Out of 151 prescriptions studied; 108 prescriptions were found to have an injectable prescribed. Percentage of encounter with injectable was at (71.52%)

Percentage of drugs prescribed from the WHO essential drug list

Out of 1112 incidences of drugs prescribed; there were 767 incidences where drugs prescribed were from the list of essential medicines. Percentage of drugs prescribed from the list of essential medicine stood at (68.97%).

Analysis of prescriptions provided to elderly using beer's criterion

Prescriptions provided to elderly patients was analyzed for inappropriateness of drug use making use of Beer's list in which list of Potential Inappropriate Medicines (PIM) for elderly population is provided in categorized manner under three categories; namely:

Medication to avoid in older adults;

Medicines to be avoided in combinations with specific co-Morbidities;

Medications to be used in caution in older adults

Each appearance of a drug in prescriptions that is categorized as PIM was considered as a single incidence of it being prescribed. The total number of each type of PIM was expressed as the number of prescriptions in which it appeared. It was further expressed in terms of the percent ratio of the total number of prescriptions that were studied. The types of PIMs and the incidences of their appearance is listed below in Table No.3

Table 3: List of PIMS and The incidences of their appearances.

Category	Name of the drugs	Total no of prescriptions	Percentage *(n = 366)↓
1. Medication to be Avoided in older adults.	Pantoprazole	105	28.68%
	Ceftriaxone	67	19.94%
	Levocetirizine	28	7.65%
	Ace brophylline	18	4.91%
	Dexamethasone	16	4. 37%
	Furosemide	12	3.27%
	Ondansetron	19	5.19%
	Losartan	16	4.37%
	Glimepiride	11	3.00
	Ranitidine	6	1.63%%
	NSAIDs	27	7.37%
	Pregabalin	5	1.37%
		330	
2. Medicines to be avoided in combinations with specific co-Morbidity	Cardiovascular	NIL	0.00%
	CNS	NIL	0.00%
	GI	NIL	0.00%
	Kidney/Urinary tract	NIL	0.00%
3. Medications to be used in caution in older adults	Probenecid	3	0.81%
	Ciprofloxacin	6	1.63%

4. PIM and to be avoided in patients with varying levels of kidney function	Ciprofloxacin	6	1.63%
	Ranitidine	8	2.18%
	Tramadol	3	0.81%
	Colchicine	4	1.09%
	Pregabalin	6	1.63%
	Total incidences of PIM	366	

* % calculated using total PIMs detected (366).

Among a total 1112 incidences of drugs prescribed under 151 prescriptions, there were 366 incidences where the prescribed drugs were PIMs

Of the151 prescriptions studied 44 had at least one PIM listed under Beer's list; (29.14 %).

Among Drugs under Category I; Pantoprazole appeared in105 prescriptions; ceftriaxone in 67 followed by levocetirizine 28. Acebrophylline appeared in 18 prescriptions, dexamethasone in 16, furosemide in 12. Ondansetron in 19; losartan in 16; glimepiride in 11; ranitidine in 6; NSAIDs in 27 and Pregabalin in 5.

Under the third category "Medications to be used with caution", there were 3 prescriptions in which the PIM probenecid was prescribed and 6 in which the PIM ciprofloxacin was prescribed. that are classified under Category 3

Incidences of usage of medicines under Main ATC Classification

Each of the medicines prescribed was categorized on the bases of the Main ATC category to which it belongs. Appearance of the medicine in a prescription was considered as an Incidence. Number of incidences of its appearance in all the prescriptions was noted. The value was then expressed as the percent ratio of the total incidences of all drugs prescribed.

Table No. 4: Usage of medicines classified in accordance with ATC system of classification.

Category of drugs	No. of drugs	Percentage (n = 1112)
NSAIDs	85	7.64%
Antimicrobial agents	147	13.21%
Drugs acting on Hematological systems	33	2.96%
Anti-Hypertensive agents	92	8.27%
Drugs acting on GI Systems	106	9.5%
Drugs used on endocrine system	82	7.37%
Drugs acting on Respiratory systems	97	8.72%
Vitamins, Minerals and Dietary	125	11.24%

supplement		
Drugs used in dyslipidemia	91	8.18%
Drugs acting on CNS	48	4.31%
Total	1112	-------

A total of 1112 medicines were prescribed to 151 patients.

of the 1112 drugs incidences of drugs prescribed, most frequently prescribed were from the class-Antimicrobial agents (13.21%),; followed by the class-Vitamins, minerals and dietary supplement (11.24%); class- Drugs acting on GI system (9.5%); class-drugs acting on respiratory system (8.72%); class- Anti-hypertensive agents (8.27%); class-Drugs used in dyslipidemia 91(8.18%); class-Drugs acting on CNS (4.31%)and class- Drug acting on hematological system (2.96%).

DISCUSSION

In our study out of 151 elderly patients, more female patients (51%) visited the in-patients departments. Most of them were in age group of 65-69(70.86%) followed by age group of 70-74 years (11.92%), confirms female preponderance.

With regard to WHO drug prescribing indicators, the average number of drugs prescribed in our study was 7.36. Study carried out among geriatrics patients in India and USA, found an average of 7.3 and 8.1 drugs per prescription respectively.[11,14]

The prescription with the highest number of drugs in our study had 15 drugs. IT is preferable to keep the number of drugs per prescription as low as possible, since polypharmacy leads to increase risk of drug interactions, increased hospital cost and errors of prescribing. Use of 5 or more is considered as polypharmacy, which was observed in 124(82.11%) patients in our study. In similar study from Singapore, Germany and Irish, polypharmacy was found in 75.25%, 60% and 26.7% of patients respectively.[11,15,16]

The magnitude of polypharmacy in our study is significantly more when compared to three other earlier studies, the increased polypharmacy in our study could be due to decreased awareness about drugs, drug-drug interactions and its adverse effects among physicians. Prescribing patterns of drug reflects the clinical judgment of the clinicians. Our study revealed polypharmacy in geriatric patients with an average number of drugs per prescription being 7.36. This deviates from the WHO standards of 1.6 to 4.8. Polypharmacy,

unfortunately is very common in India and some other under-developing and developing countries.

The percentage of drug prescribed by generic name was just 51.25%, but falls short of WHO recommendations of 100%. This implies that the prescribers are not complying with the recommendations of WHO prescriber indicator.

Prescribing by generic name allows flexibility of stocking and dispensing of various brands of drugs that are cheaper than and as effective as proprietary brands. This is the basis of essential drug list use. It results in increased cost of treatment, which may lead to non-adherence by patients as they have more medicines than they can cope with. It also increases the risk of significant adverse drug interactions.

Moreover, from our study we found 68.97% of drug prescribed were fall on WHO essential drug list. We identified that prescribing of antibiotics did not fell within the WHO recommended range of 20-26, while prescribing of injection was higher than the recommended range of WHO (13.4-24%). About 57.46%of drugs prescribed meet beer's criteria.

In this study the percentage of drugs prescribed from the Indian national essential drug list was 68.97 %, though it was comparable with other Indian studies but was still on lower side when compare to standard (100%). Hence we should educate and encourage our medical practitioners to understand the importance of prescribing from essential drug list, so as to ensure rational use of medicines in elderly patients.

Inappropriate medication uses in patients 65 years and above has been linked to many adverse drug reactions; poor physical functioning and excess health care use. Interventions could target more appropriate drug selection by physicians to elderly patients. In most of the prescriptions dose and duration were not mentioned which also justifies inappropriate prescribing.

Limitation of the study

- Only inpatients were included in the study. It would have been in depth analysis if we had included outpatients.
- Shorter duration of study.

- Study site was restricted to only one hospital, so we were not able to assess data of general population.

CONCLUSION

Distribution of subjects under different age categories is not uniform with the highest number of subjects distributed in the age group of 65-69; followed by the age group of 70-74. Together they constitute 83.44% of the geriatric subjects who were prescribed medicines for ailments that they exhibited. There was trend of; number of subjects decreasing; with increase in age. The least number of subjects was observed in the age group of ≥ 85. There is a near equal distribution of the subjects in the age group of 65-79; with respect to Gender. The pattern is observed to change towards a decrease in male subjects and increase in female subject as age increases. Poly pharmacy was evident with the average number of drugs prescribed per prescription at 7.36, with the number of drugs prescribed in a prescription ranging from 1-9. It deviates strongly from the standard set by WHO at < 2 per prescription.

Percentage of drugs prescribed by generic names and by brand names was nearly equal which deviates from WHO standard set at 100 % generic Prescribing of an antibiotic was observed in more than half of the prescriptions provided; which deviates from the WHO standard of <30 %Prescribing of injection was observed in nearly three fourth of the prescriptions provide; which deviates from WHO standard of <20 % Prescribing of medicines covered under the list of essential drugs was 68.97 %; which deviates from WHO standard of 100%. Twelve of thirty six medicines categorized in Beer's list as "those to be avoided in older adults" have been prescribed. They collectively constituted 330 incidences and represented 30.49% of total the incidences of medicines prescribed.

The percentage of prescriptions having one or more medicines mentioned under Beer's was (29.14 %). There were no incidences of PIMs Under category 2 in any of the prescription studied. Among the PIM there were 3 prescriptions for probenecid and 6 for ciprofloxacin that are classified under Category3.

There were 27 incidences of PIMs under the category "PIM and to be avoided in patients with varying levels of kidney function" being prescribed. Out of 23 drug types listed under it 5 types have been prescribed. Poly pharmacy and use of PIMs are the prevalent that elderly and are potential risk factors for drug-related problems. Hence, optimization of drug prescribing for the elderly is the need of the hour, and there is an urgent need for guidelines

in India, to define and categorize appropriate prescribing in the elderly. It also calls for a critical review of the tools that are available to measure the inappropriate prescriptions and their effects and discuss their predictive validity in Indian population. More so physicians have to integrate clinical and pharmacological perspectives when reviewing medications for the elderly.

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