

Analysis of the Prevalence and Pattern of Polypharmacy among Elderly Patients in General Medicine and Orthopaedic Department of a Tertiary Care Hospital in Pondicherry

Nikita Rao Nalla¹, Narayanasamy S², B.R.Asokan³, Kamali A⁴

¹Junior Resident Department of Pharmacology, Aarupadai Veedu Medical College and Hospital, Pondicherry.

²Associate Professor Department of Pharmacology, Aarupadai Veedu Medical College and Hospital, Pondicherry, India

³Professor Department of Pharmacology, Aarupadai Veedu Medical College and Hospital, Pondicherry.

⁴Junior Resident, Department of Pharmacology, Aarupadai Veedu Medical College and Hospital, Pondicherry.

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Corresponding Author: Narayanasamy S

Conflict of interest: Nil

Abstract:

Introduction: Global population aging continues to be a significant phenomenon. Due to their various chronic illnesses, which necessitate the use of multiple medications, elderly persons are more likely to be prescribed multiple medications, a practice known as polypharmacy (PP) or potentially inappropriate medication (PIM).

Aims and Objectives: This study set out to:

(1) To assess the prevalence and incidence of polypharmacy among the elderly patients in general medicine and orthopaedic department.

(2) Assess the prescription pattern and which medications were most commonly administered to this group of people.

Methods: This Hospital-based Prospective and observational study will be conducted in AVMCH a tertiary care teaching hospital was carried out on senior patients who visited the out-patients departments (OPD) of General medicine and orthopaedics. The Institutional Ethical Committee granted approval for the trial, which ran for a full year from May 2023 to April 2024. Data on the demographic data, prescribing pattern of drugs (polypharmacy), total number of prescribed drugs, and main and adjuvant drugs prescribed to patients during treatment given to patients were gathered and entered on excel sheet.

Results: Of the 600 patients, 315 men and 285 Women were involved in the research. Minor polypharmacy (two to four drugs) accounted for 86.5% of the prevalence, major polypharmacy (five or more drugs) for 13.0%, and hyper polypharmacy (ten or more drugs) for 0.5%. Most often recommended medications in department of medicine included NSAIDs, multivitamins, PPI, leukotriene receptor antagonists, H2 blockers and antihistamines, which accounted for 99.3%, 41.7%, 41.0%, 14.0%, 12.0% and 10.0% respectively. In orthopaedics department NSAIDs, vitamins, proton-pump inhibitors, H2 receptor blockers, pregabalin, agents, antacids, antispasmodics and opioids analgesics, they accounted for 145.3%, 68.7%, 47.7%, 25.0%, 13.7%, 13.7%, 7.0% and 3.0%. respectively.

Conclusion: polypharmacy is no doubt a global issue however it is avoidable and treatable with the right prescription. Future medication usage strategies for senior patients will employ a multidisciplinary team comprising physicians, nurses, and pharmacists. This study can further be extended with more number of cases and for a longer duration to get a broad idea on the potential DDIs in various other departments with respect to the wide range of diseases encountered.

Keywords: Polypharmacy, drug interaction, geriatric, pharmacist, Beer's criteria, drugs, PIMs,

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Introduction

Polypharmacy is one of the most common problems among the elderly patients. In India, the elderly population is estimated at about 96 million [1]. Polypharmacy means the use of more medications than clinically indicated. Polypharmacy is classified

as, minor 2-4 drugs, major is 5 or more drugs and hyper polypharmacy means if 10 or more drugs per day respectively [2,3]. Inappropriate prescribing in the elderly population is now considered a major public health issue because of its direct association

to morbidity, mortality and wastage of health resources. Inappropriate prescribing to elderly patients is influenced by the total number of drugs prescribed to an elderly patient. The present study is designed to evaluate the prescribing pattern of elderly patients in the department of General Medicine and Orthopaedics in order to reduce the burden of polypharmacy and medication error [1].

Rationale: The pharmacodynamics and pharmacokinetics are changed by age-related physiological changes. These changes make some medicines particularly dangerous for older individuals, when safer alternatives are available, prescribing such medications may not be acceptable. So, the case for screening possibly unsuitable drugs (PIMs) seems strong. Beers criteria are the most widely referred tool internationally because of their high reliability and reproducibility. Published literature related to the epidemiology of PIM use in elderly in this part (Puducherry state) of the country is limited. With this background, the study was initiated to find the prevalence of PIMs in elderly in a tertiary care hospital in Puducherry using the 2019 AGS beers criteria.

Research Question-

“Whether the health care providers follow the standard guidelines for the rational prescription of appropriate drugs among elderly patients in a tertiary care hospital.”

Expected outcome: Polypharmacy is of substantial importance, in terms of both direct and indirect medication costs resulting from drug-related morbidity, moreover it is a preventable problem. Physicians and pharmacists have potential in combatting this problem through a variety of interventions such as reducing the number of medications, reducing the number of doses, increasing patient adherence, preventing adverse drug interactions and improving the quality of life and establish the use of Rational drug therapy and thereby reducing drug-related inappropriateness and morbidity in the elderly population prevented. **Hypothesis-** There is a relation with prescribing pattern of drugs and BEERs criteria for potentially appropriate and inappropriate medications.

Novelty: Polypharmacy is a common health issue and is very common among elderly patients due to increasing life span making them prone to multiple health conditions. In India, it is estimated that elderly people constitute almost 13% of the population but they consume 30% of prescribed drug. Most of these patients are known to consume 5- 12 drugs, therefore, it increases the incidence of mortality, morbidity and drug interactions. Polypharmacy can be prevented by using a multidisciplinary approach. So, the present study is designed to evaluate the prescribing pattern among the elderly patients by using Standard criteria

(AGS's BEERS CRITERIA) to reduce the inappropriate prescription of drugs and medication error and the burden of polypharmacy in a tertiary care hospital.

Aim & Objective:

1. To evaluate the prevalence and incidence of polypharmacy among the elderly patients in general medicine and orthopaedic department.
2. To analyse the prescription pattern, that is, the most commonly prescribed medications in the elderly population.

Materials and Methods:

Inclusion Criteria:

- Patients of both the genders aged 60 years and above
- Hospital outpatient in the Department of General Medicine and Orthopaedics

Exclusion Criteria:

- Patients below 60 years of age.
- Hospital inpatient care patients
- Emergency patients like intensive care unit patient

Hospital-based Prospective and observational study will be conducted in AVMCH a tertiary care teaching hospital in out-patients departments (OPD) of General medicine and orthopaedics from May 2023 to April 2024.

Sample size and sampling frame-The source population is elderly patients aged 60 years and above.

The sample size is 300 Patients in general medicine and 300 patients in Orthopaedics by using the standard formula [4]. Consent from the respective head of departments were taken. With anonymous consent from patients, data will be collected from each patient- demographic data, prescribing pattern of drugs (polypharmacy), total number of prescribed drugs, and main and adjuvant drugs prescribed to patients during treatment will be analysed.

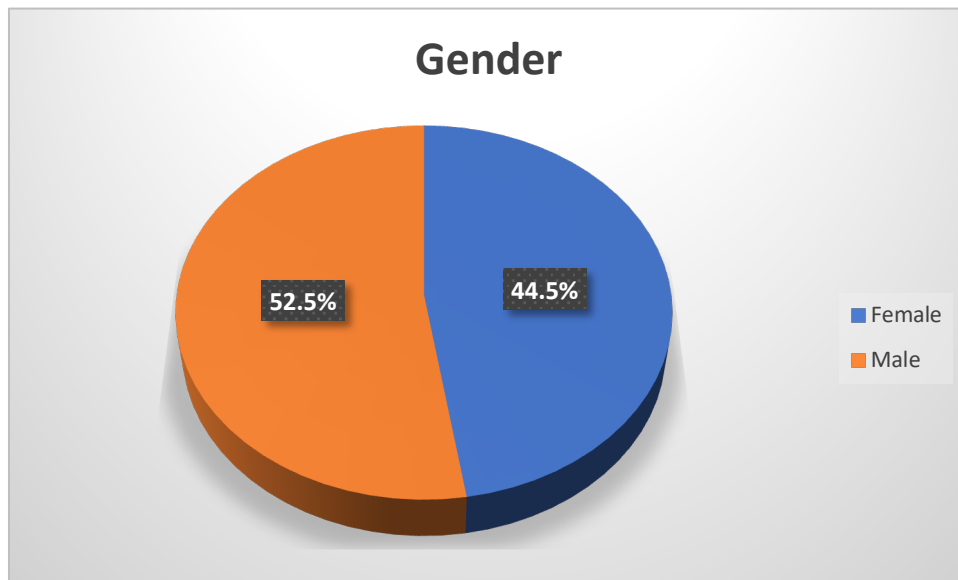
Collected data will be assessed for appropriateness and inappropriateness of medications prescribed to patients during treatment based on Beers criteria-2019, a comprehensive set of explicit criteria that gives status to a drug as appropriate or inappropriate for the elderly aged 60 years and above in given conditions Fifty-three inappropriate medications or medication classes included in the 2019 AGS beers criteria, which are categorized into three categories are as the PIMs and classes to avoid in elderly patients (Category A), medications and classes to avoid in elderly patients with certain diseases and syndromes (Category B) or medications to be used with caution in elderly (Category C). A prescription was considered to be inappropriate if it contained

one or more drugs included in 2019 AGS beers criteria.

- Statistical method- Chi square test.
- The data was collected and entered into excel sheets and then analysed using the MS EXCEL and SPSS 20.0.

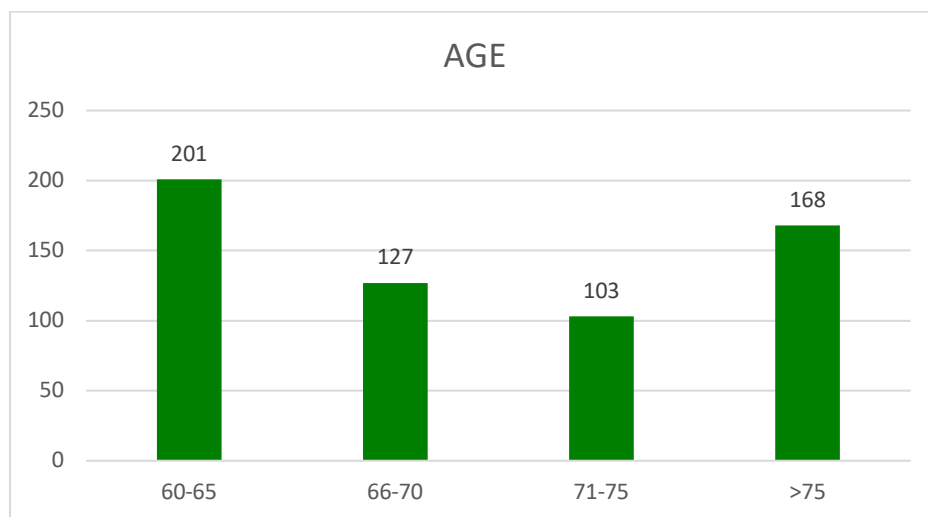
- Demographic data and groups of drugs prescribed to the patients will be expressed in percentages

Result:



In this study, out of 600 elderly patients, 315 (52.5%) were male and 285 (44.5%) were female. It was observed that more number of male patients experienced polypharmacy in each department which was 55.0% in

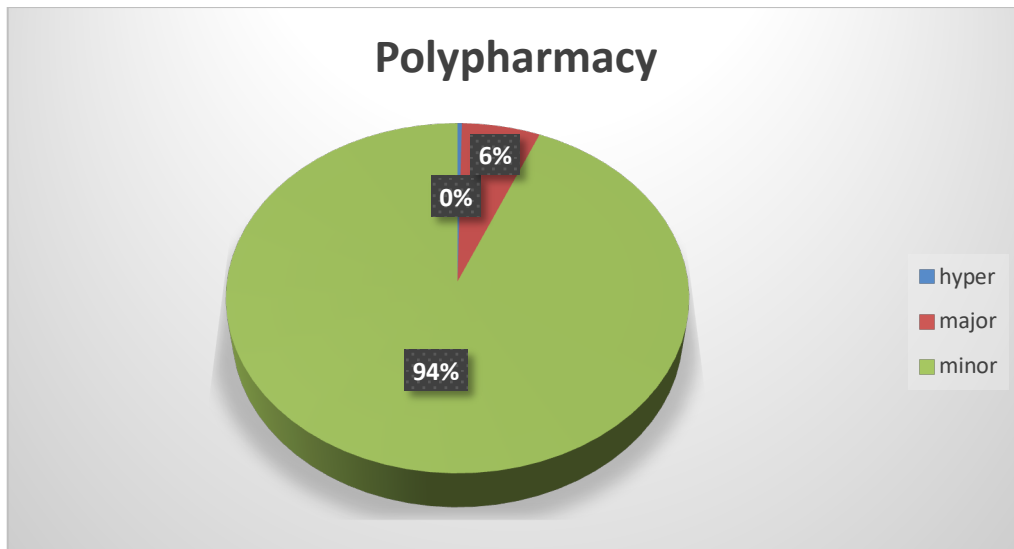
orthopaedics department when compared to female patients which was 45.0% respectively. However, in medicine department both genders experienced equal polypharmacy which is 50.0% respectively.



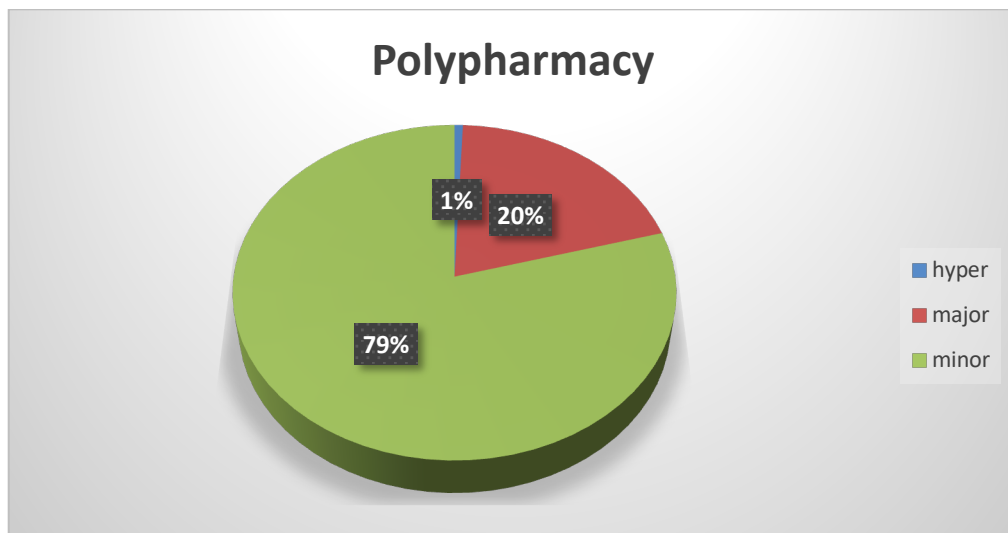
Furthermore, polypharmacy was most commonly seen in patients of 60–65 years age-group (33.6%) followed by patients >75 years age-group (28.0%) and the least in 71-75 years (17.2%) respectively (Table 1). Similar observations were seen in individual departments where 103 (34.3%) patients from orthopaedics department belonged to 60-65 yrs age group while only 16.3% were from 70-

75 year and 32.8% of patients attending medicine OPD belonged to 60–65 years, and 28.8% of them were >75 years while only 18.8% were aged 70-75 years.

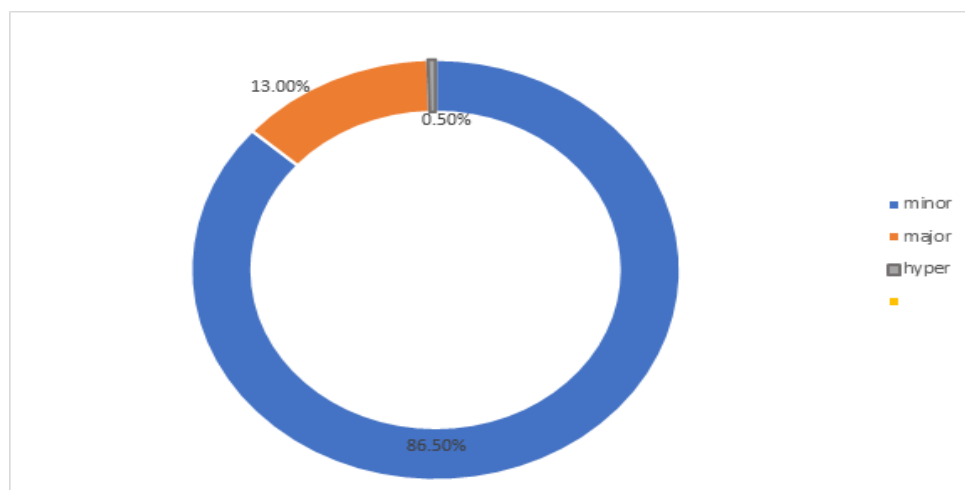
Moving on, the prevalence of hyper, major, and minor polypharmacy in orthopaedics department was 0.3%, 6% and 93.7% respectively.



Likewise, in medicine department the prevalence of minor polypharmacy (2–4 drugs) accounted for 79.3%, major polypharmacy (≥ 5 drugs) for 20.0%, and hyper polypharmacy (≥ 10 drugs) for 0.7%.



Overall, the pattern of polypharmacy including both departments is shown in the table below (Table 2). It can be seen that the prevalence of minor was 86.5%, major 13.0%, hyper 0.5% respectively.



		GROUP				Total	
		Medicine		Ortho			
		N	%	N	%	N	%
Polypharmacy	hyper	2	0.7%	1	0.3%	3	0.5%
	major	60	20.0%	18	6.0%	78	13.0%
	minor	238	79.3%	281	93.7%	519	86.5%
Total		300	100.0%	300	100.0%	600	100.0%

Most commonly prescribed drugs in orthopaedics department among elderly patients were NSAIDs, vitamins, proton-pump inhibitors, H2 receptor blockers, pregabalin, agents, antacids, antispasmodics and opioids analgesics, they accounted for 145.3%, 68.7%, 47.7%, 25.0%, 13.7%,13.7%,7.0% and 3.0%. respectively.

PRESCRIBED DRUG	FREQUENCY	PERCENTAGE
PROTON PUMP INHIBITOR	143	47.7
H2 BLOCKERS	75	25.0
MUCOSAL PROTECTANT	1	0.3
NSAIDS	436	145.3
PENICILLIN ANTIBIOTICS	1	0.3
MULTI VITAMIN	206	68.7
BIGUANIDES	1	0.3
PREGABALIN	41	13.7
STATINS	3	1.0
ANTACIDS	41	13.7
BENZODIAZEPINES	7	2.3
ANTISPASMODICS	21	7.0
ANTIDIARRHEAL	5	1.7
ANTIVERTIGO DRUGS	5	1.7
ANTIEMETIC DRUGS	8	2.7
CALCIUM CHANNEL BLOCKERS	6	2.0
OPIOD ANALGESICS	9	3.0
LACTOBACILLUS	7	2.3
ANTI-ANGINAL	8	2.7
CEPHALOSPORINS	3	1.0
CORTICOSTEROIDS	3	1.0
OTHERS	3	1.0
ANTICHOLINERGICS	7	2.3
SEDATIVES	1	0.3

Drugs that were of the highest frequency in department of medicine included NSAIDs, multivitamins, PPI, leukotriene receptor antagonists, H2 blockers and antihistamines, which accounted for 99.3%, 41.7%, 41.0%, 14.0%,12.0% and 10.0% respectively.

PRESCRIBED DRUG	FREQUENCY	PERCENTAGE
PROTON PUMP INHIBITOR	123	41.0
H2 BLOCKERS	36	12.0
MUCOSAL PROTECTANT	31	10.3
NSAIDS	298	99.3
ANTIPLATELETS	1	0.3
ANTIPYRETIC	1	0.3
NITROFURANTOIN	2	0.7
ALPHA GLUCOSIDASE INHIBITORS	10	3.3
ANTIEMETIC DRUGS	21	7.0
ALKALINISING AGENT	16	5.3
ANTIPLATELETS	29	9.7
ANTIHISTAMINES	30	10.0

ARBS	13	4.3
ASPIRIN	18	6.0
BEGUANIDES	1	0.3
BENZODIAZEPINES	9	3.0
DIURETICS	16	5.3
ELCTROLYTES	1	0.3
EXPECTORANT	23	7.7
ANTACID	6	2.0
INSULIN	15	5.0
L -THYROXINE	1	0.3
LACTOBACILLUS	26	8.7
LEUKOTREINE RECEPTOR ANTAGONIST	42	14.0
MULTIVITAMIN	125	41.7

Discussion

Drug treatment planning in old age is complex due to comorbid diseases, renal and liver changes, and difficulty in estimating glomerular filtration rate and hepatic excretion. Patients with multiple diseases are typically prescribed multiple drugs. [5] Based on the current study results, it is observed that there is relation between polypharmacy and older people were out of 600 elderly patients, prevalence of hyper, major, and minor polypharmacy was 0.5%, 13.0% and 86.5% respectively. Unlike the study conducted by Mohammad *et al.* [11] which shows that of 1003 prescriptions, 403 (40.18%) prescriptions were found to be of minor polypharmacy and 600 (59.82%) prescriptions were of major polypharmacy, in our study the prevalence of minor polypharmacy was more. Our study can be compared with the study done by Agrawal *et al* [6] which revealed that ≤ 4 number of drugs were prescribed to 74% population, 5–9 number of drugs were prescribed to 25% population, and 10–14 number of drugs were prescribed to 1% population. Another study done by Dhanapal *et al.* [9] revealed that out of 502 prescriptions, 61 (11.73%) prescriptions were minor polypharmacy and 457 (88.26%) prescriptions were major polypharmacy. Likewise, study by Kumar *et al* show Prevalence of minor polypharmacy 81.15% and major 18.85%. Similar result has been noted in the previous study conducted by Srikanth and Sireesha and Nagaraju *et al.* [7,8,18] While the study done by Saldanha *et al.*, to evaluate pattern, predictors, and outcome of polypharmacy among elderly perioperative patients, the prevalence of polypharmacy was 84.6% and prevalence of high-level polypharmacy was 11.1%., in our study, the prevalence of hyper polypharmacy (≥ 10 drugs) accounted to only 0.03%. [10]

Another study done in Singapore, showed that drug-related problems, which include ADRs, unnecessary drug therapy, untreated conditions, and inappropriate choice of drugs, reported an incidence rate as high as 25%. [12,13] Our study had relatively less incidence of DDIs which included PPIs, pregabalin, amiodarone, alpha blockers, h2

blockers, NSAIDs. Furthermore, In the study conducted by Mohammad *et al* [1] the most commonly prescribed drugs were vitamins, proton-pump inhibitors, antipyretic agents, H2 receptor blockers whereas, in our study drugs involved in potential DDIs based on beers criteria included NSAIDs, antacids, multivitamins, leukotriene receptor antagonists, antihistamines, antacids, pregabalin, antispasmodics, PPI, and H2 blockers. Our study can be compared to the study obtained from Mohammad *et al.*

Patients were divided into four categories based on their age: 60-65years, 66-70years, 70-75 years and > 75 years, of the total patients gathered $n= 600$, 33.6% ($n= 201$) belonged to 60-65 age range, followed by 21.2% ($n=127$), 17.2% ($n=103$), 28.2% ($n=168$) respectively. Study conducted by Tamilselvan *et al.*, [1] to analyse incidence of polypharmacy and drug-related problems among geriatric patients. The highest frequency of elderly patients with polypharmacy was from age group 65–70 years (65%). [12] Another study done by Mohammad, *et al.*: shows that Polypharmacy was more commonly seen in patients of 60–65 years age-group (60.55%). Our study also shows similar results to McMillan *et al* [21] who had analysed prescription by using computer-based prescription retrieval system and he found that elderly population was significantly linked to Polypharmacy. Reason may be increase in the prevalence of disease and change in physiology or increase in the number of elder populations.

In most of the studies of PP female sex and high age have been predictors of Polypharmacy, but few studies showed no correlation. Our results show that there is a higher prevalence of polypharmacy among the men than women where, out of 600 patients present, 52.5% being male and women comprised of 47.5% of the total. Likewise, Mohammed *et al* [11] found a higher prevalence of drug use among the men than women and adults are more prone to PP. Other study reports are also similar. [16,17,] and [19]. This may be due to the fact that male patients were more visited than female patients during our study. The study by Nagaraju *et al* and Kim *et al* [15,

18]. found PP was also associated with male gender. Montamat et al summarized the study conducted that PP, the inappropriate use of multiple drug regimens, has a significant impact on the health of elderly individuals [20]. Our study shows similar results. [22-25]

Limitations:

- To the best of our knowledge there are a smaller number of published researches that evaluate the prevalence of polypharmacy in an Out patients set up.
- Our study also had limitations due to its small sample size and the fact that there was no data on the no. of pills the patient takes every day, nor on any non-prescription drugs and supplements taken as this information was not available in the medical records.
- Another limitation of our study is that ours is single centre study so result cannot be generalized to entire population.

Risks and Benefits of Study:

□ Polypharmacy increases the risk of prescribing cascades.

□ Prescribing cascades” is said when signs and symptoms of an Adverse drug reaction is misinterpreted as a disease and a new treatment / drug therapy is further added to the earlier prescribed treatment to treat the condition. This inherits the potential to develop further more side effects and thus making a prescribing cascade.²³

□ Benefit of the study – to create awareness among healthcare workers and patients regarding use of inappropriate drug use and promote a multidisciplinary approach towards the rational use of drugs and in patient’s compliance.

Conclusion:

Our study has highlighted the prevalent practice of polypharmacy in hospitals, particularly in the elderly age group. In the future, a multidisciplinary approach that will be implemented for promoting rational drug use to minimize polypharmacy, especially in geriatric populations, shall be implemented. It is possible to avoid polypharmacy and treat it by recommending suitable medications, using pharmaceuticals responsibly, and routinely reviewing patients' medication schedules.

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