

# Assessment Of Potentially Inappropriate Prescriptions Among Geriatric Population Using START/STOPP Criteria In Indian Geriatric Patients

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## Abstract

The purpose of this study was to understand the prevalence of Polypharmacy and Potentially Inappropriate prescription and medication use in the geriatric population, using the Screening Tool to Alert Right Treatment (START)/ Screening Tool of Older Persons Prescription (STOPP) screening tools. Polypharmacy and Inappropriate prescribing pose a challenge to tackle the erratic use of medication for the elderly, in the treatment of their one or many underlying conditions. The prescription of multiple medications could lead to the rise of Adverse drug reactions during the treatment period. To prevent the rise of such potential conditions, prescription screening tools such as START/STOPP are used to alert Potentially Inappropriate Medications (PIMs) and optimize therapy. A prospective observational study was conducted using the case sheets of 166 geriatric patients prescribed with a total of 916 medications that were screened for PIMs using the START/STOPP screening tool. Out of the 916 medications screened, 252 medications were identified as PIMs, out of which the highest category of PIMs seen was in the polypharmacy group (use of 5-9 drugs simultaneously) at the rate of 42%(n=108). The results of this study provide evidence that there is an increase in the incidence of PIMs with respect to polypharmacy. By applying the screening tools such as the START/STOPP criteria in the prescriptions, the rise in PIMs can be prevented that will help optimizing the selection and use of medications in elderly patients.

**Keywords:** Polypharmacy, Potentially Inappropriate Prescribing (PIP), Potentially Inappropriate Medications (PIMs), START and STOPP criteria, Geriatrics.

## Introduction:

Ageing is a natural phenomenon which cannot be stopped or controlled. It is believed that by 2030, 1 in 6 people in the world will be aged 60 years or older and by 2050, the world's population of people aged 60 years or older will become 2.1 billion and that of persons aged 80 years and older expected to triple between 2020-2050 to reach 426 million.<sup>[1]</sup> India's elderly population aged 60 years and above is projected to touch 194 million in

2031 from 138 million in 2021, a 41% increase over a decade, according to the National Statistical office (NSO), India. According to a report, currently 67 million males and 71 million females in 2021 which will increase to 93 million males and 101 million females by 2031 respectively wherein Kerala has the highest elderly population (16.5%) followed by Tamil Nadu (13.6%), Himachal Pradesh (13.1%), Punjab (12.6%) and Andhra Pradesh (12.4%) in 2021.<sup>[2]</sup>

As geriatric population is rising, a necessity comes to improve their health and quality of life. Rational prescribing of drugs becomes a challenging task as age related issues comes in way. Almost all geriatric patients will be on multiple drugs due to multiple chronic diseases and age-related physiological and pathological changes in hepatic and renal function which affects the pharmacodynamics and pharmacokinetics profiles of medicines. These factors make geriatric patients more prone to drug-related adverse events combined with drug-drug and/or drug-disease interactions, increased hospitalization and increased healthcare cost, a growing health problem.<sup>[3,4,5]</sup> A Longer life expectancy, comorbidity and the strict adherence to evidence-based clinical practice guidelines pave the way for polypharmacy. Cascade prescribing, i.e., medication resulting in adverse drug reactions (ADRs) which are treated with another medication could be one of the many factors involved in polypharmacy of the aged population.<sup>[6]</sup> Polypharmacy and inappropriate prescribing (IP) are the major risk factors for ADRs causing Adverse events. IP consists of PIMs and PPOs commonly encountered in older people. PIMs and Prescription Omissions (PPOs) are closely related to ADEs and ADRs, but they are preventable. PIMs can lead to number of ADRs, drug-drug and drug disease interactions, while PPOs fail to provide necessary protection against morbidity and mortality from certain diseases common in the elderly.<sup>[7]</sup> A study conducted by Pandey and Saharan estimated the prevalence of polypharmacy in Indian geriatric population as 4.2%, and another study conducted by Saldhana et. al. reported the prevalence of polypharmacy as 84.6% and the prevalence of high-risk level polypharmacy (intake of 10 or more drugs) was reported as 11.1%.<sup>[8,9]</sup>

Polypharmacy and inappropriate prescribing probes a challenge to the erratic medication use in the geriatrics and resulting in its associated detrimental effects on the elderly. The impact of IP lead to development of various screening tools to detect and evaluate PIMs to assist the healthcare providers in selecting safer therapy, and lessen the exposure of the elderly to PIMs. Two sets of tools have acquired international recognition: the American Geriatric Society Beers Criteria

and Screening Tool of Older People's Potentially Inappropriate Prescriptions criteria and Screening Tool to Alert Doctors to Right Treatment (STOPP/ START) criteria.<sup>[3,10]</sup> Beer's criteria, the most popular tool for studies on geriatric prescribing, has limitations like less importance being given to under use of drugs, drug interactions and therapeutic duplication. On the other hand, STOPP comprises of 80 indicators pertaining primarily to important drug-drug and drug disease interactions and therapeutic duplication. START incorporates 34 criterion-based indicators of prescribing omissions. STOPP/ START criteria are considered as the most up to-date set of explicit criteria for evaluating geriatric prescriptions based on drugs prescribed and disease present and require little clinical judgement, thus suitable for use by researchers, students and clinicians.<sup>[4]</sup> STOPP/START criteria have been shown to be significantly associated with ADEs in acutely ill older people, unlike Beer's criteria.<sup>[7]</sup>

#### **Methods:**

The study was conducted to analyze the prevalence of polypharmacy, PIM usage in geriatric inpatients in a secondary care hospital with respect to STOPP/START criteria, so as to get an idea of pattern of drug prescription in geriatric patients as well as frequency of potentially inappropriate prescription and to take corrective measures if found necessary. The study was approved by the Institutional Ethics Committee and Informed consent was sought from patients before enrolment.

A prospective observational study was performed in the Government Medical College and Hospital, a tertiary care teaching hospital, Ooty, Nilgiris District. The study was conducted for a duration of 6 months from October 2020 to March 2021 prospectively. The targeted population were geriatric patients aged  $\geq 65$  years of either sex, taking multiple drugs and hospitalized. The patients with dementia, impaired memory, no proper responding or with psychological disorder were excluded from the study.

#### **Data Collection:**

The data was collected in a pre-structured data collection form prospectively from case sheets and face to face interview, the details recorded

were the hospital medical record number, patient initials, age, sex, diagnosis, co-morbidities, drugs prescribed - dose, route, frequency & duration and laboratory information. The attending physicians were also asked to provide all necessary information regarding the patient's chronic diseases and prescribed medications through accessing the patients. The patients willing to participate in the study were ensured confidentiality of their information and Informed consent was taken from them. The collected information was carefully reviewed by using the screening tool START/STOPP to assess the PIMs.

The data were tabulated using Microsoft Excel and the statistical analysis were done using SPSS v. 25. The continuous variables were expressed as mean  $\pm$  standard deviation and the categorical variables were given as the

number of observations (absolute frequency) and percentages (relative frequency).

### Results:

A total of 166 patients were enrolled in the study according to the inclusion criteria. A total of 916 medications were prescribed within all cases that were screened for PIM's using START/STOPP screening tool. The participated geriatric patients' age ranged between 65-88 years, out of which 86 were male and 80 were female and the mean age of study population was 65 years. The majority of subjects belonged to 65 to 75  $\pm$  5.89 years of age (77.1%) and only 6.02% were above 85 years of age. Table 1 shows the demographics by gender and age. Table 2 shows the distribution of cases according to disease category.

**Table 1: Demographics of patients by gender and age**

Sl. No	Age Group	Number of patients
1.	65 – 74 years	128
2.	75 – 84 years	28
3.	85 years and above	10
	<b>Total Patients</b>	<b>166</b>

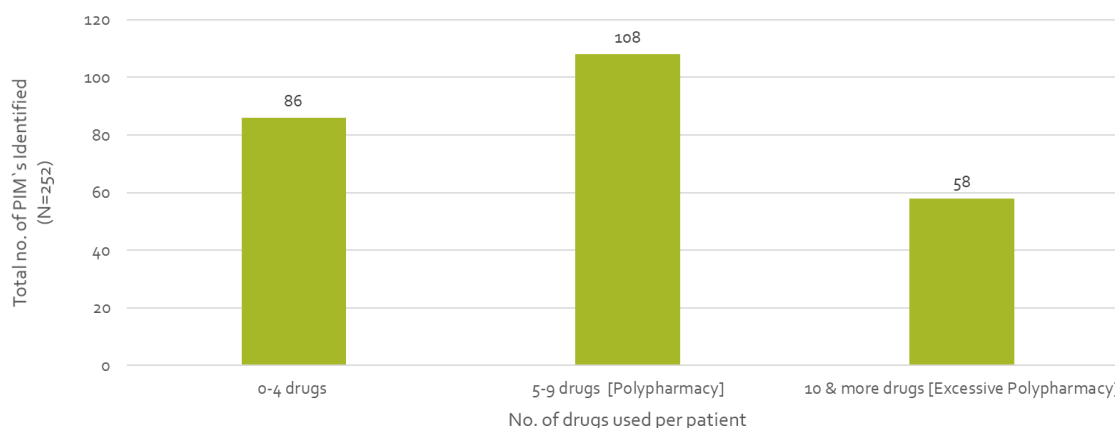
**Table 2: Cases found in each disease system according to ICD 11**

Disease Category	No. of Cases
Endocrine, nutritional and metabolic conditions	36
Respiratory system	26
Circulatory System	20
Infections/ Parasitic	20
Digestive System	18
Musculoskeletal system/ Connective tissue	18
Genitourinary System	16
Nervous System	12

Out of 166 cases, 88 cases were identified to contain PIMs as per the drug list of START/STOPP criteria, out of which 58 were with polypharmacy. The prevalence of polypharmacy (simultaneous use of 5 or more medications) was calculated to be 65%. By using the screening tool START/STOPP around 252 drugs have been deemed as potentially inappropriate in which, 232 drugs were categorized under the STOPP criteria and 20 were using the START criteria.

As shown in Figure 1 highest category of PIMs was seen in the polypharmacy group (5-9 drugs simultaneously) at 42% (n=108), followed by the polypharmacy group (less than 4 drugs simultaneously) at 34% (n=86) and finally the excessive polypharmacy group (more than 10 drugs simultaneously) at 23% (n=58).

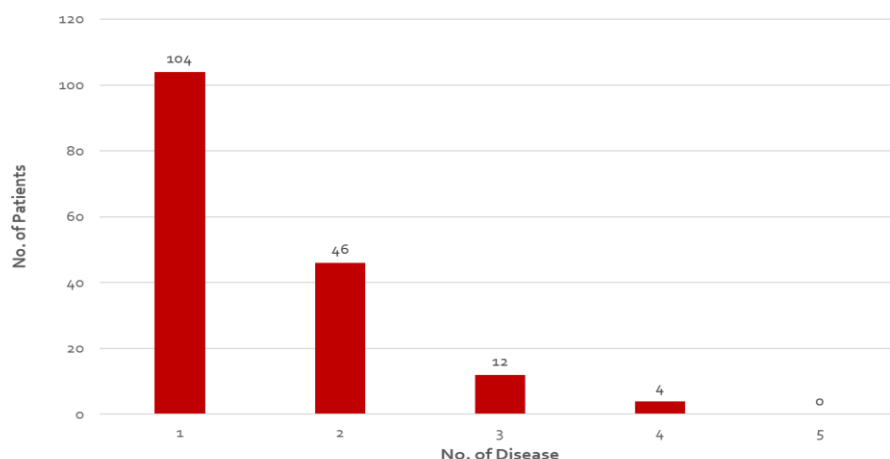
**FIGURE 01- TOTAL INAPPROPRIATENESS FOUND IN POLYPHARMACY PATIENTS**



In the sampled 166 cases, most of the patients presented with only one illness (62%; n = 104), while patients with two illnesses (27%; n = 46),

three illnesses (7%; n = 12) and greater than four illnesses (2%; n=4) as shown in Figure-2

**FIGURE 02- DISEASE PREVALENCE**



The most inappropriate medication that was prescribed was Aspirin. Out of 252 inappropriate medications identified, 44 of them turned out to be Aspirin which accounts for 19% of the total PIMs. Aspirin was given for pain management for most of the patients in the practice site. But in certain conditions according to the screening tool it was deemed as inappropriate due to its risk of causing

gastrointestinal ulcer, exacerbation of hypertension as well as increased risk of thrombotic events. Following aspirin, the next highest potentially inappropriate medication identified was Nifedipine accounting for 17% (n=40) of PIMs and Insulin accounted as 10% (n=24) as the third most common PIM class of drugs. Number of Times Inappropriate drugs were administered is shown in Table 3

**Table 3: Frequency of PIMs administered**

Drugs Administered	No. of times drugs administered
Verapamil	4
CPM	10
Digoxin	12
Nifedipine	40

Spironolactone	10
Alprazolam	8
Diazepam	6
Insulin	24
Metoclopramide	12
Aspirin	44
Diclofenac	20
Ibuprofen	16
Tramadol	4
Theophylline	10
Carbamazepine	4
Dicyclomine	8

### Discussion:

The proportion of the elderly is increasing every decade across the world and it is a known fact that the elderly and drugs are inseparable; the reason being the presence of underlying chronic disease conditions. These elderly people have been the subjects prescribed with polypharmacy and thus inappropriate prescribing is very commonly seen in elderly patients. Many studies have shown that drug related morbidity and mortality is often preventable by simply avoiding the use of inappropriate drugs. Usage of these inappropriate drugs is the main risk factor associated with drug related ailments. There are many explicit criteria to screen for PIM use in the elderly but amongst them START and STOPP criteria is the most evidence one.

Polypharmacy has been linked to a variety of characteristics, including age, gender, education level, number of drugs, drug-drug interactions, interventions, and co-morbidities, in several studies. Polypharmacy is widespread among geriatric patients. According to the findings of this research, males are more likely to have serious polypharmacy than females. The hospital stay is lengthened in geriatric patients due to increase in major polypharmacy compared with minor polypharmacy similar to study conducted a Dhanapal CK.<sup>12</sup> In a study conducted by Al Ameri MN, Makramalla E, and Albur U, the number of drug interactions continued to rise as the number of drugs used by geriatric

individuals increased.<sup>10</sup>

The study conducted by Sganga F et al.<sup>[13]</sup> analysed whether geriatrics using multiple drugs have increased risk of rehospitalization and mortality after hospital discharge. No such follow-up was possible in the present study. With a total of 916 medications that were prescribed to the participants, it is observed (Table 6) that the polypharmacy group (using 5-9 drugs simultaneously) had the highest incidence of PIMs prescribed to them which is 42%. This result helped us to confirm that there is a relationship between increase in incidence of PIMs with polypharmacy. Since the number of inappropriate drugs were given more in cases of pain, the finding of Aspirin being most prescribed is contributory to the rise in identification of PIM's.

### Conclusion:

The incidence of polypharmacy among the geriatric patients are slowly rising. This study found out that majority of patients who fall under the category for medication screening are males (51.8%) who belong to the age group of 65 to 75 years. It is the duty of all Health care professionals to be aware of inappropriate prescribing with respect to the patient's age and they must evaluate all medications for each geriatric patient to prevent polypharmacy and improve the quality of life. Physician should prescribe evidence-based medicine and educate the patient about their drug therapy. This study also suggest that further studies are required with larger population to evaluate the consequences of

polypharmacy and inappropriate prescribing to avoid complications in elderly patients. Pharmaceutical care for geriatric patient by the way of resolving and preventing drug related problems and also improve their quality of life to be given.

### Acknowledgements

“We acknowledge the generous research infrastructure and supports from JSS College of Pharmacy, JSS Academy of Higher Education & Research, Rocklands, Ooty, The Nilgiris, Tamilnadu, India” and Government medical College Hospital, The Nilgiris, Tamilnadu, India

### Conflict of interests

The authors have no conflict of interest.

### References:

1. OECD. Preventing ageing unequally. OECD Publishing, Paris. 2017. <https://doi.org/10.1787/9789264279087-en>.
2. World Health Organization. (2015). World report on ageing and health. World Health Organization. Available from: <https://apps.who.int/iris/handle/10665/186463>.
3. India's elderly population grows to 13.8 cr in 2021 over lower death rates: NSO study [Internet]. Business Today. In. 2021 Aug 15 (cited 2022 Jan 25). Available from: <https://www.businesstoday.in/lifestyle/health/story/indias-elderly-population-grows-to-138-cr-in-2021-over-lower-death-rates-nso-study-304209-2021-08-15>
4. Elderly population up, Tamil Nadu has second highest [Internet]. The Times of India. 2021 Aug 16 (cited 2022 Jan 25). Available from: <https://timesofindia.indiatimes.com/city/chennai/elderly-population-up-tamil-nadu-has-second-highest/articleshow/85358197.cms>
5. Pandey M, Saharan V. Prevalence and risk factors of polypharmacy among elderly in Mumbai. *World J Pharm Sci* 2017; 6:902-907.
6. Jetha S. Polypharmacy, the Elderly, and Deprescribing. *Consult Pharm.* 2015;30(9):527-532. doi:10.4140/TCP.n.2015.527
7. Al Ameri MN, Makramalla E, Albur U, Kumar A, Rao P. Prevalence of polypharmacy in the elderly: Implications of age, gender, comorbidities and drug interactions. *J Pharm Sci* 2014;1(3):1-7.
8. Thomas RE, Thomas BC. A Systematic Review of Studies of the STOPP/START 2015 and American Geriatric Society Beers 2015 Criteria in Patients  $\geq$  65 Years. *Curr Aging Sci.* 2019;12(2):121-154. doi:10.2174/1874609812666190516093742
9. O'Mahony D, O'Sullivan D, Byrne S, O'Connor MN, Ryan C, Gallagher P. STOPP/START criteria for potentially inappropriate prescribing in older people: version 2 [published correction appears in *Age Ageing.* 2018 May 1;47(3):489]. *Age Ageing.* 2015;44(2):213-218. doi:10.1093/ageing/afu145
10. Fahrni ML, Azmy MT, Asir E, Aziz NA, Hassan Y. Inappropriate prescribing defined by STOPP and START criteria and its association with adverse drug events among hospitalized older patients: A multicenter, prospective study. *PLoS One.* 2019;14(7): e0219898. Published 2019 Jul 26. doi: 10.1371/journal.pone.0219898
11. Lam MP, Cheung BM. The use of STOPP/START criteria as a screening tool for assessing the appropriateness of medications in the elderly population. *Expert Rev Clin Pharmacol.* 2012;5(2):187-197. doi:10.1586/ecp.12.6
12. Dhanapal CK. Prevalence of polypharmacy in geriatric patients in rural teaching hospital. *Am J Phytomed Clin Ther* 2014; 2:413-9.
13. Sganga F, Landi F, Ruggiero C, et al. Polypharmacy and health outcomes among older adults discharged from hospital: results from the CRIME study. *Geriatr Gerontol Int.* 2015;15(2):141-146. doi:10.1111/ggi.12241